

Worksheet

Company: KPC
Location: West desert - Egypt
Facility: QASR Compressor station
PHA Method: HAZOP
PHA Type: Initial

Process:

File Description:

Date:

Process Description:

Chemicals:

Purpose:

Scope:

Objectives:

Filters: No Filter Applied

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (1) 17/07/2013

Node: (1) Main compressors' suction header (OT: 57.2 °C; OP: 70 - 35.9 barg) Intention: Feed line to compressors

Drawings: 3538-200-KKD-12210

3538-200-KKD-12353

3538-200-KKD-12355

3538-200-KKD-12359

3538-200-KKD-12360

3538-200-KKD-12361

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	1. No/ Less Flow	<p>1.1. No Flow from existing unit (Tie-in Point 007-008)</p> <p>1.2. BV-179 is closed due to misoperation</p> <p>1.3. Spurious closure of ESDV-030A</p>	<p>1.1.1. Loss of production when running with 2 suction lines</p> <p>1.1.2. possible Surge of compressor (Node 03A)when running with one suction line</p> <p>1.2.1. Same As 1.1.1., 1.1.2</p> <p>1.2.2. increase in pressure in existing facility</p> <p>1.3.1. Same As 1.1.1., 1.1.2., 1.2.2</p>	<p>1.1.1.1. Low flow alarm (FIC 012)</p> <p>1.1.1.2. Low pressure alarm (PIC 091) on common suction header</p> <p>1.1.2.1. Compressor QA-K-8001A/B/C/D equipped with anti-surge Control system (Node 03A)</p> <p>1.1.2.2. Low pressure alarm (PIC 091) on common suction header</p> <p>1.2.1.1. BV-179 is configured as LO</p> <p>1.2.1.2. Low pressure alarm (PIC 091) on common suction header</p> <p>1.2.2.1. Existing facility is equipped with proper safeguard against high pressure</p> <p>1.2.2.2. Low pressure alarm (PIC 091) on common suction header</p> <p>1.3.1.1. ESDV 030A is equipped with limit switches with alarm in DCS</p> <p>1.3.1.2. Low pressure alarm...</p>		

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Session: (1) 17/07/2013

Node: (1) Main compressors' suction header (OT: 57.2 °C; OP: 70 - 35.9 barg) Intention: Feed line to compressors

Drawings: 3538-200-KKD-12210
3538-200-KKD-12353
3538-200-KKD-12355
3538-200-KKD-12359
3538-200-KKD-12360
3538-200-KKD-12361

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	1. No/ Less Flow (cont.)	1.3. Spurious closure of ESDV-030A (cont.)	1.3.1. Same As 1.1.1., 1.1.2., 1.2.2 (cont.)	...(PIC 091) on common suction header		
		1.4. Spurious Closure of ESDV-031A	1.4.1. Same As 1.1.1., 1.1.2., 1.2.2	1.4.1.1. ESDV 031A is equipped with limit switches with alarm in DCS		
				1.4.1.2. Low pressure alarm (PIC 091) on common suction header		
		1.5. No Flow from existing unit (Tie-in Point 005)	1.5.1. Same As 1.1.1., 1.1.2	1.5.1.1. Low flow alarm (FIC 013)		
				1.5.1.2. Low pressure alarm (PIC 091) on common suction header		
		1.6. BV at tie-in 005 is closed due to misoperation	1.6.1. Same As 1.1.1., 1.1.2., 1.2.2	1.6.1.1. BV at tie-in 005 is configured as LO		
				1.6.1.2. Low pressure alarm (PIC 091) on common suction header		
		1.7. Failure close of FV012A	1.7.1. Less Pressure to compressor suction (#03A)	1.7.1.1. Low pressure alarm (PIC 091) on common suction header		
			1.7.2. Pressure More in existing facility	1.7.2.1. Availability of Maximum Flow Limiter (software based) to reduce the maximum flow rate in the line to maximum allowed		
		1.8. Failure close of FV012B	1.8.1. Same As 1.7.1., 1.7.2			

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Node: (1) Main compressors' suction header (OT: 57.2 °C; OP: 70 - 35.9 barg) Intention: Feed line to compressors

Drawings: 3538-200-KKD-12210

3538-200-KKD-12353

3538-200-KKD-12355

3538-200-KKD-12359

3538-200-KKD-12360

3538-200-KKD-12361

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	1. No/ Less Flow (cont.)	1.9. Failure close of FV012C	1.9.1. Same As 1.7.1, 1.7.2			
		1.10. Failure close of FV013A	1.10.1. Same As 1.7.1, 1.7.2			
		1.11. Failure close of FV013B	1.11.1. Same As 1.7.1, 1.7.2			
More	2. More Flow	2.1. No Cause identified				
		2.2. Failure open of FV012A	2.2.1. Pressure More in suction of compressor (#03A)			
			2.2.2. Process upset in the existing facility (production separators)	2.2.2.1. Existing facility is equipped with proper safeguard against high pressure		
		2.3. Failure open of FV012B	2.3.1. Same As 2.2.1, 2.2.2			
		2.4. Failure open of FV012C	2.4.1. Same As 2.2.1, 2.2.2			
		2.5. Failure open of FV013A	2.5.1. Same As 2.2.1, 2.2.2			
		2.6. Failure open of FV013B	2.6.1. Same As 2.2.1, 2.2.2			
Reverse	3. Reverse Flow	3.1. Failure open of control valve	3.1.1. Possible gas back flow to condensate circuit	3.1.1.1. Check valve		
		3.2. No gas flow from existing facility	3.2.1. Possible gas condensate back flow to existing facility.	3.2.1.1. Check valve at existing facility.		
Misdirected	4. Misdirected Flow	4.1. Spurious Opening of BDV...	4.1.1. Unexpected flaring	4.1.1.1. BDV 010 is equipped...		

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Node: (1) Main compressors' suction header (OT: 57.2 °C; OP: 70 - 35.9 barg) Intention: Feed line to compressors

Drawings: 3538-200-KKD-12210

3538-200-KKD-12353

3538-200-KKD-12355

3538-200-KKD-12359

3538-200-KKD-12360

3538-200-KKD-12361

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	4. Misdirected Flow (cont.)	...010	4.1.1. Unexpected flaring (cont.)	...with limit switch with alarm in DCS		
			4.1.1.2. BDV 010 is equipped with air accumulator to allow three strokes in case of instrument air failure.			
			4.1.2. No/less flow to compressor QA-K-8001A (Node 03A).	4.1.2.1. Same As 4.1.1.1, 4.1.1.2		
			4.1.3. Partial production losses	4.1.3.1. Same As 4.1.1.1, 4.1.1.2		
			4.1.4. Less Temperature in HP flare header, leading to possible hydrate formation in the flare header .	4.1.4.1. Same As 4.1.1.1, 4.1.1.2		
				4.1.4.2. Availability of methanol injection in the flare header.		
		4.2. Manual Valve in Methanol Injection left open due to misOperation	4.2.1. Back flow of process gas to methanol injection circuit , leading to increase of pressure of methanol injection circuit .	4.2.1.1. Check valve in methanol injection line	1. Remove the Locked Open configuration on Methanol injection Isolation valves.	ENPPI
				4.2.1.2. Methanol injection circuit has the same design pressure of suction gas line		

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Node: (1) Main compressors' suction header (OT: 57.2 °C; OP: 70 - 35.9 barg) Intention: Feed line to compressors

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3538-200-KKD-12361

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	5. Higher Temperature	5.1. More Temperature from existing facility	5.1.1. Increase of temperature in suction line 5.1.2. More Temperature in compressor discharge (# 03A).	5.1.1.1. Design temperature of suction line is consistent with existing facility design temperature,		
Less	6. Lower Temperature	6.1. Refer To 4.1 (Misdirected Flow due to Spurious Opening of BDV 010) 6.2. Less Temperature from existing units due to excessive cooling. 6.3. Low ambient temperature.	6.2.1. No Significant consequence 6.3.1. Possible condensate / hydrates formation in the inlet line of BDV 010	6.2.1.1. Low Temperature alarm on TI 031. 6.3.1.1. The inlet line of BDV 010 is sloped to main suction line in order to drain the condensate . 6.3.1.2. Provision of methanol injection in the inlet line of BDV 010 .	2. Verify by a general evaluation document the possibility of hydrate formation in suction and discharge lines of all BDVs and PSVs installed in the high pressure sections of the unit, taking into account the project gas composition.	ENPPI

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3538-200-KKD-12361

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	7. Higher Pressure	<p>7.1. Failure of PIC 091 / FIC 012/013 in open position .</p> <p>7.2. Failure open of FCV 012 A/B/C</p> <p>7.3. Failure open of FCV 013 A/B</p> <p>7.4. stop of the compressor QA-K-8001A</p>	<p>7.1.1. Increase of pressure in the suction line leading to no significant consequences for the mechanical integrity of the line.</p> <p>7.1.2. More Pressure in compressor discharge (# 03A).</p> <p>7.2.1. Same As 7.1.1.</p> <p>7.3.1. Same As 7.1.1.</p> <p>7.4.1. Same As 7.1.1.</p>	7.1.1.1. Design pressure of the suction line is the same as the existing facility design pressure.		
Less/ Vacuum	8. Less/ Vacuum Pressure	<p>8.1. Refer To 4.1 (Misdirected Flow due to Spurious Opening of BDV 010)</p> <p>8.2. Failure of PIC 091 / FIC 012/013 in close position</p>	<p>8.2.1. Possible surge of compressor QA-K-8001A/B/C/D (Node 03A/B/C/D) when running with one suction line</p>	<p>8.2.1.1. Compressor QA-K-8001A/B/C/D equipped with anti-surge Control system (Node 03A/B/C/D)</p> <p>8.2.1.2. Low pressure alarm on PIC 091 on common suction header</p>		

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3538-200-KKD-12361

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	9. Higher Level	9.1. Not applicable				
No/ Less	10. No/ Less Level	10.1. Not applicable				

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Node: (1) Main compressors' suction header (OT: 57.2 °C; OP: 70 - 35.9 barg) Intention: Feed line to compressors

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3538-200-KKD-12361

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	11. Different Composition	11.1. Different Composition in the existing facility	11.1.1. No Significant consequence in this node.			
	12. Deposition	12.1. Not Applicable				

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3538-200-KKD-12359
3538-200-KKD-12360
3538-200-KKD-12361

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	13. Others Maintenance	13.1. Corrosion issues	13.1.1. No Significant consequences	13.1.1.1. Corrosion is not expected in accordance with selected piping material.		
		13.2. Periodic maintenance	13.2.1. Need for isolation venting, draining and purging of the header .	13.2.1.1. Availability of fixed devices for isolation venting and draining. High point vent and low point drains to be provided for line. 13.2.1.2. Provision for utility station for nitrogen purging.		

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Node: (1) Main compressors' suction header (OT: 57.2 °C; OP: 70 - 35.9 barg) Intention: Feed line to compressors

Drawings: 3538-200-KKD-12210
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3538-200-KKD-12355
3538-200-KKD-12359
3538-200-KKD-12360
3538-200-KKD-12361

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	14. Others Other	14.1. Incorrect opening of ESDV 030A during start up due to misoperation.	14.1.1. Possible gas hammering in down stream piping leading to potential mechanical damage .	14.1.1.1. PDZA 906 to inhibit the opening of main line valve (ESDV030A) if the differential pressure exceeds 2 bar.		
		14.2. Incorrect opening of ESDV 031A during start up due to...	14.2.1. Possible hammering in down stream piping leading to...	14.2.1.1. PDZA 907 to inhibit the opening of main line valve...		

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Node: (1) Main compressors' suction header (OT: 57.2 °C; OP: 70 - 35.9 barg) Intention: Feed line to compressors

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3538-200-KKD-12355
3538-200-KKD-12359
3538-200-KKD-12360
3538-200-KKD-12361

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others (cont.)	14. Others Other (cont.)	...misoperation.	...potential mechanical damage(ESDV031A) if the differential pressure exceeds 2 bar.		

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Node: (1) Main compressors' suction header (OT: 57.2 °C; OP: 70 - 35.9 barg) Intention: Feed line to compressors

Drawings: 3538-200-KKD-12210
3538-200-KKD-12353
3538-200-KKD-12355
3538-200-KKD-12359
3538-200-KKD-12360
3538-200-KKD-12361

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	15. Failure Utility	15.1. Loss of electrical power 15.2. Loss of instrument air	15.1.1. Possible loss of process control 15.2.1. Spurious closure of ESDV 030A - ESDV 031A 15.2.2. Spurious opening of BDV 010	15.1.1.1. UPS provided as backup for all control system. 15.2.1.1. ESDV 030A and ESDV 031A equipped with limit switches (with alarm in DCS) 15.2.2.1. BDV 010 is equipped with limit switches (with alarm in DCS) 15.2.2.2. BDV 010 is equipped air accumulator to allow three strokes in case of instrument air failure.		

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Company: KPC
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Session: (2) 18/07/2013

Node: (2A) Compressor "A" suction including Compressor Suction Drum Train A QA-V-8001 A (OT: 57.2°C; OP: 35.9 barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12250

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	16. No/ Less Flow (gas)	<p>16.1. Manual valves in the suction line of QA-V-8001 A closed due to misoperation</p> <p>16.2. Spurious closure of ESDV 101A</p> <p>16.3. Failure close of PV 123</p> <p>16.4. Demister Partial Blockage</p>	<p>16.1.1. Compressor QA-K-8001A Surge leading to possible mechanical damage(#03A) .</p> <p>16.1.2. Partial loss of production</p> <p>16.1.3. Increase of pressure in the existing facility.</p> <p>16.2.1. Same As 16.1.1, 16.1.2, 16.1.3</p> <p>16.3.1. Same As 16.1.1, 16.1.2, 16.1.3</p> <p>16.4.1. Same As 16.1.1, 16.1.2, 16.1.3</p>	<p>16.1.1.1. Compressor QA-K-8001A equipped with anti-surge control system (Node 03A)</p> <p>16.1.2.1. Spare compressor train</p> <p>16.1.3.1. Existing facility is equipped with proper safeguard against high pressure</p> <p>16.2.1.1. ESDV 101A is equipped with limit switches (with alarm in DCS)</p> <p>16.2.1.2. Same As 16.1.1.1 & 16.1.2.1</p> <p>16.3.1.1. Same As 16.1.1.1 & 16.1.2.1</p> <p>16.4.1.1. Same As 16.1.1.1, 16.1.2.1</p> <p>16.4.1.2. Design pressure of QA-V-8001A is suitable for maximum suction pressure from existing facility</p> <p>16.4.1.3. PDI 121 High Alarm across demister</p>	<p>3. Verify the possibility to configure PV123 as fail open.</p>	ENPPI/ SOLAR

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Session: (2) 18/07/2013

Node: (2A) Compressor "A" suction including Compressor Suction Drum Train A QA-V-8001 A (OT: 57.2°C; OP: 35.9 barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12250

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	16. No/ Less Flow (gas) (cont.)	16.4. Demister Partial Blockage (cont.)	16.4.2. increasing pressure inside the vessel QA-V-8001A	16.4.2.1. Same As-16.1.1.1., 16.1.2.1.	4. Provide high alarm on PDIT 108 across temporary strainer	ENPPI
		16.5. Temporary strainer blockage in the suction line of compressor QA-K-8001A	16.5.1. Same As-16.1.1., 16.1.2., 16.1.3., 16.4.2	16.5.1.1. Same As-16.1.1.1., 16.1.2.1.		
		16.6. Partial blockage of check valve upstream QA-V-8001A due to mechanical damage .	16.6.1. Same As-16.1.1., 16.1.2., 16.1.3	16.6.1.1. Same As-16.1.1.1., 16.1.2.1. 16.6.1.2. Non slam check valve		
		16.7. Compressor trip QA-K-8001A	16.7.1. Same As-16.1.2., 16.1.3	16.7.1.1. Same As-16.1.1.1., 16.1.2.1.		
More	17. More Flow (gas)	17.1. Shutdown of the other compressor train	17.1.1. No significant consequences			
Reverse	18. Reverse Flow (gas)	18.1. Compressor QA-K-8001A (#03A) operating in fully recycle mode	18.1.1. Possible back flow of the compressed gas to the suction line leading to increase of pressure.	18.1.1.1. Check valve upstream QA-V-8001A		
Misdirected	19. Misdirected Flow (gas)	19.1. Partial leaking of PSV 105 A/B	19.1.1. Unexpected flaring 19.1.2. Loss of production 19.1.3. Possible condensate / Hydrates formation vent line downstream PSV105A/B	19.1.1.1. Operating and maintenance procedures	:Refer To 2	

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Node: (2A) Compressor "A" suction including Compressor Suction Drum Train A QA-V-8001 A (OT: 57.2°C; OP: 35.9 barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12250

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	20. No/ Less Flow (condensate)	<p>20.1. Spurious closure of ESDV 103</p> <p>20.2. Failure close of LV 102</p> <p>20.3. Manual valves in the condensate outlet line of QA-V-8001A closed due to misoperation</p> <p>20.4. Partial blockage of check valve in discharge line of QA-V-8001A due to mechanical damage .</p>	<p>20.1.1. More Level in QA-V-8001A</p> <p>20.2.1. Same As 20.1.1</p> <p>20.3.1. Same As 20.1.1</p> <p>20.4.1. Same As 20.1.1</p>	<p>20.1.1.1. ESDV 103 is equipped with limit switches (with alarm in DCS)</p> <p>20.2.1.1. LV 102 is equipped with limit switches (with alarm in DCS)</p> <p>20.3.1.1. Operating procedures</p>		
More	21. More Flow (condensate)	21.1. Failure open LV102	21.1.1. Less level in QA-V-8001A	21.1.1.1. LV 102 is equipped with limit switches (with alarm in DCS)		
Reverse	22. Reverse Flow (condensate)	22.1. More pressure QA-V-8005A (#5B)	22.1.1. Possible back flow of gas from QA-V-8005A to QA-V-8001A	22.1.1.1. Check valve in the QA-V-8001A discharge line		
Misdirected	23. Misdirected Flow (condensate)	23.1. Manual valve in the methanol injection line left open due misoperation	23.1.1. Increase of methanol consumption.	23.1.1.1. Availability of normally close double block and bleed connection.		

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Session: (2) 18/07/2013

Node: (2A) Compressor "A" suction including Compressor Suction Drum Train A QA-V-8001 A (OT: 57.2°C; OP: 35.9 barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12250

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	24. Higher Temperature	24.1. More Temperature from existing facility	24.1.1. Increase of temperature in suction line leading to no significant consequences in this node 24.1.2. More Temperature in compressor QA-K-8001A discharge (# 03A).	24.1.1.1. Design temperature of suction line is consistent of existing facility design temperature.		
Less	25. Lower Temperature	25.1. Low ambient temperature.	25.1.1. Possible condensate / hydrates formation in the inlet line of PSV105A/B 25.1.2. Possible wax formation in the condensate discharge line 25.1.3. Possible wax formation in the level instrument connections, leading to operating problems.	25.1.1.1. Inlet line of PSV105A/B is sloped to main suction line in order to drain the condensate. 25.1.2.1. Heat tracing in the condensate line. 25.1.3.1. Availability of heat tracing for level instruments of all condensate drums.	:Refer To 2 5. Indicate the availability of the heat tracing for level instruments installed in condensate drum in all applicable P&IDs	ENPPI

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Node: (2A) Compressor "A" suction including Compressor Suction Drum Train A QA-V-8001 A (OT: 57.2°C; OP: 35.9 barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12250

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	26. Higher Pressure	26.1. Demister of QA-V-8001A partial blockage	26.1.1. Increase of the pressure in QA-V-8001A below design pressure	26.1.1.1. QA-V-8001A design pressure is the same of the compressor design pressure QA-K-8001A		
		26.2. The strainer blockage in the suction line	26.2.1. Same As 26.1.1			
		26.3. Compressor trip QA-K-8001A	26.3.1. Same As 26.1.1			
		26.4. External fire .	26.4.1. Over pressurization of QA-V-8001A leading to mechanical damage	26.4.1.1. PSV 105A/B sized for fire case.		
Less/ Vacuum	27. Less/ Vacuum Pressure	27.1. ESDV101 A spurious closure	27.1.1. possible vacuum condition in QA-V-8001A	27.1.1.1. QA-V-8001A is designed for F.V.		

Session: (2) 18/07/2013

Node: (2A) Compressor "A" suction including Compressor Suction Drum Train A QA-V-8001 A (OT: 57.2°C; OP: 35.9 barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12250

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	28. Higher Level	28.1. Spurious closure of ESDV 103	28.1.1. Overfilling of QA-V-8001A leading to liquid carry over to the compressor QA-K-8001A with possible mechanical damage (#03A).	28.1.1.1. ESDV 103 is equipped with limit switches (with alarm in DCS).		
				28.1.1.2. LZA 107 (High High)...		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (2) 18/07/2013

Node: (2A) Compressor "A" suction including Compressor Suction Drum Train A QA-V-8001 A (OT: 57.2°C; OP: 35.9 barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12250

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	28. Higher Level (cont.)	<p>28.1. Spurious closure of ESDV 103 (cont.)</p> <p>28.2. Failure close of LV 102</p> <p>28.3. Manual valves in the condensate outlet line of QA-V-8001A closed due to misoperation</p>	<p>28.1.1. Overfilling of QA-V-8001A leading to liquid carry over to the compressor QA-K-8001A with possible mechanical damage (#03A). (cont.)</p> <p>28.2.1. Same As 28.1.1</p> <p>28.3.1. Same As 28.1.1</p>	<p>...Interlock for compressor QA-K-8001A shut down</p> <p>28.1.1.3. LIC 102 with high level alarm.</p> <p>28.2.1.1. LV 102 is equipped with limit switches (with alarm in DCS)</p> <p>28.2.1.2. Same As 28.1.1.2</p> <p>28.3.1.1. operating procedures.</p> <p>28.3.1.2. Same As 28.1.1.2</p>		
No/ Less	29. No/ Less Level	29.1. Failure open of LV 102	29.1.1. Gas blow by to the condensate suction drum QA-V-8005A (#05B) leading to More Pressure in QA-V-8005A (#05B)	29.1.1.1. LZA 101 (low low) Interlock to close the shutdown valve ESDV 103 on liquid discharge line.		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (2) 18/07/2013

Node: (2A) Compressor "A" suction including Compressor Suction Drum Train A QA-V-8001 A (OT: 57.2°C; OP: 35.9 barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12250

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	30. Different Composition	30.1. Different Composition from the existing facility	30.1.1. No Significant consequence .			
	31. Deposition	31.1. Refer To 25.1 (Low ambient temperature)				

Session: (2) 18/07/2013

Node: (2A) Compressor "A" suction including Compressor Suction Drum Train A QA-V-8001 A (OT: 57.2°C; OP: 35.9 barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12250

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	32. Others Maintenance	32.1. Periodic gas sampling	32.1.1. The operator needs to reach the new sample connection located downstream QA-V-8001A (Gas Phase)		6. Check sample connection downstream QA-V-8001A to be located in accessible location for operator during 3D model review .	ENPPI
		32.2. Periodic maintenance	32.2.1. Need for isolation venting , draining and purging of the QA-V-8001A.	32.2.1.1. Availability of fixed devices for isolation venting & draining . High point vent and low point drains to be provided for line . 32.2.1.2. Provision for utility station for nitrogen purging.		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (2) 18/07/2013

Node: (2A) Compressor "A" suction including Compressor Suction Drum Train A QA-V-8001 A (OT: 57.2°C; OP: 35.9 barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12250

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others (cont.)	32. Others Maintenance (cont.)	32.3. Maintenance of LV 102	32.3.1. Needs to operate by-pass line of LV 102		7. Add a note in all applicable P&IDs that the level gauge of all condensate drums shall be visible from manual valve of by-pass line of relevant level control valve installed on liquid discharge line.	ENPPI
		32.4. Corrosion issues	32.4.1. No Significant consequences	32.4.1.1. Corrosion is not expected in accordance with selected piping material.		

Session: (2) 18/07/2013

Node: (2A) Compressor "A" suction including Compressor Suction Drum Train A QA-V-8001 A (OT: 57.2°C; OP: 35.9 barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12250

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	33. Other	33.1. Incorrect opening of ESDV 101 A during start up.	33.1.1. Possible hammering in down stream piping leading to potential mechanical damage .	33.1.1.1. PDZA 101 to inhibit the opening of main line valve (ESDV101A) if the differential pressure exceeds 2 bar.		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (2) 18/07/2013

Node: (2A) Compressor "A" suction including Compressor Suction Drum Train A QA-V-8001 A (OT: 57.2°C; OP: 35.9 barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12250

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	34. Failure Utility	34.1. Loss of electrical power	34.1.1. Possible loss of process control	34.1.1.1. UPS provided as backup for all control system .		
		34.2. Loss of instrument air	34.2.1. Spurious closure of ESDV 101 A/B, ESDV103	34.2.1.1. ESDV 101 A/B, ESDV 103 equipped with limit switches (with alarm in DCS)		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	35. No/ Less Flow	35.1. No Flow from QA-V-8001A (#02A)	35.1.1. Compressor QA-K-8001A Surge leading to possible mechanical damage.	35.1.1.1. Compressor QA-K-8001A equipped with anti-surge Control system, operating anti surge valve FV103 35.1.1.2. PI110 low low pressure interlock to stop compressor QA-K-8001A 35.1.1.3. Low pressure alarm on PI112 35.1.1.4. Low Flow alarm on FI102	8. SOLAR to provide dynamic simulation of the compressor circuit with indication of turn down values.	SOLAR
		35.2. Stop of compressor QA-K-8001A	35.1.2. Partial loss of production 35.2.1. Increase of pressure in the existing facility.	35.1.2.1. Spare compressor train 35.2.1.1. Existing facility is equipped with proper safeguard against high pressure		
		35.3. Failure of speed controller reducing the speed	35.3.1. Increase of pressure in the existing facility.(suction) 35.3.2. Less pressure in the discharge of the compressor.	35.3.1.1. Low speed alarm SIT-101	9. SOLAR to check the presence of low speed alarm on SIT-101	SOLAR
		35.4. Spurious closure of ESDV102A in discharge of compressor (#04A)	35.4.1. More Pressure in QA-K-8001A discharge line.	35.4.1.1. ESDV 102A is equipped with limit switch with alarm in DCS 35.4.1.2. PSV114A/B sized for...		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	35. No/ Less Flow (cont.)	<p>35.4. Spurious closure of ESDV102A in discharge of compressor (#04A) (cont.)</p> <p>35.5. Spurious closure of ESDV032A upstream TI06</p> <p>35.6. Spurious closure of ESDV033A upstream TI04</p> <p>35.7. Manual valves on QA-E-8001A left closed due to misoperation</p> <p>35.8. Partial blockage of a check valve downstream QA-V-8002A (#04A)</p> <p>35.9. Partial blockage of...</p>	<p>35.4.1. More Pressure in QA-K-8001A discharge line. (cont.)</p> <p>35.5.1. Same As 35.4.1</p> <p>35.6.1. Same As 35.4.1</p> <p>35.7.1. Same As 35.4.1</p> <p>35.8.1. Same As 35.4.1</p> <p>35.9.1. Same As 35.4.1</p>	<p>...blocked outlet scenario</p> <p>35.4.1.3. High pressure alarm on PI112</p> <p>35.4.1.4. PI111 high high pressure interlock to stop compressor QA-K-8001A</p> <p>35.5.1.1. ESDV 032A is equipped with limit switch with alarm in DCS</p> <p>35.5.1.2. Same As 35.4.1.2, 35.4.1.3, 35.4.1.4</p> <p>35.6.1.1. ESDV 033A is equipped with limit switch with alarm in DCS</p> <p>35.6.1.2. Same As 35.4.1.2, 35.4.1.3, 35.4.1.4</p> <p>35.7.1.1. Same As 35.4.1.2, 35.4.1.3, 35.4.1.4</p> <p>35.7.1.2. Operating procedures</p> <p>35.9.1.1. high differential...</p>		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	35. No/ Less Flow (cont.)	...demister of QA-V-8002A (#04A)	35.9.1. Same As 35.4.1 (cont.)	...pressure alarm on PDI-122 across demister		
More	36. More Flow	36.1. Shutdown of the other compressor train during a parallel operation 36.2. Failure of speed controller increasing the speed	36.1.1. Limited increase of compressor load leading to no significant consequences 36.2.1. Possible overspeed of turbine leading to more pressure in the discharge	36.1.1.1. High flow alarm in FI102 36.2.1.1. High speed alarm SIT-101 36.2.1.2. Overspeed interlock to shutdown the compressor by dedicated instrument.		
Reverse	37. Reverse Flow	37.1. Stop of compressor QA-K-3001A	37.1.1. Possible Reverse Flow from discharge header to compressor QA-K-3001A leading to possible mechanical damage.	37.1.1.1. Check valve downstream QA-V-8002A (#4A) 37.1.1.2. Anti-surge control loop for compressor. 37.1.1.3. In case of compressor QA-K-8001A shutdown , ESDV-102A is closed to isolate the circuit. (suction and discharge)		
Misdirected	38. Misdirected Flow	38.1. Spurious Opening of BDV101	38.1.1. Unexpected flaring	38.1.1.1. BDV 101 is equipped with limit switch with alarm in DCS 38.1.1.2. BDV 101 is equipped air accumulator to allow three strokes in case of instrument air failure.		

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Company: KPC
Facility: QASR Compressor station

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Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	38. Misdirected Flow (cont.)	<p>38.1. Spurious Opening of BDV101 (cont.)</p> <p>38.2. Partial leaking of PSV 114A/B</p> <p>38.3. QA-K-8001A dry gas seals failure</p>	<p>38.1.2. Pressure less in compressor discharge line.</p> <p>38.1.3. Partial production losses</p> <p>38.1.4. Less Temperature in HP flare header, leading to possible hydrate formation in the flare header .</p> <p>38.2.1. Unexpected flaring</p> <p>38.2.2. Loss of production</p> <p>38.2.3. Possible condensate / Hydrates formation vent line downstream PSV114A/B</p> <p>38.3.1. Possible misdirected flow of flammable gas to cold vent</p>	<p>38.1.3.1. Same As 4.1.1.1, 4.1.1.2</p> <p>38.1.4.1. Same As 4.1.1.1, 4.1.1.2</p> <p>38.1.4.2. Availability of methanol injection in the flare header.</p> <p>38.2.1.1. Operating and maintenance procedures</p> <p>38.3.1.1. Cold vent circuit (#20) is continuously flushed with nitrogen</p> <p>38.3.1.2. Cold vent stack is provided with flame arrester</p> <p>38.3.1.3. High flow interlock in compressor seal vent line to shutdown the compressor.</p>	:Refer To 2	
No/ Less	39. No/ Less Flow (vent seal)	39.1. Increase of back pressure flare header.	39.1.1. Possible damage of a dry gas seal.	39.1.1.1. PT-5167 to open AV-5167 to vent to safe location.	10. SOLAR to provide suitable dry gas seal...	SOLAR

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Facility: QASR Compressor station

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Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	39. No/ Less Flow (vent seal) (cont.)	39.1. Increase of back pressure flare header. (cont.)	39.1.1. Possible damage of a dry gas seal. (cont.)	39.1.1.1. PT-5167 to open AV-5167 to vent to safe location. (cont.)	...for a maximum 6 barg back pressure from HP flare header and update the relevant documentation accordingly.	

Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	40. Higher Temperature	40.1. Temperature More from QA-V-8001A (#2A)	40.1.1. More Temperature in the compressor QA-K-8001A discharge line leading to possible mechanical damage.	40.1.1.1. High temperature alarm on TI103 40.1.1.2. TI102 high high temperature interlock to stop the compressor QA-K-8001A		
		40.2. Failure of air cooler QA-E-8001A	40.2.1. More Temperature in QA-V-8002A (#04A) leading to possible mechanical damage	40.2.1.1. TZA108 (2oo3 redundant logic) high high temperature interlock to stop the compressor QA-K-8001A		
		40.3. Failure of TIC107...	40.3.1. Same As 40.2.1			

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Company: KPC
Facility: QASR Compressor station

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Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	40. Higher Temperature (cont.)	...shutting down QA-E-8001A	40.3.1. Same As 40.2.1 (cont.)			
		40.4. Temperature More in compressor QA-K-8001A casing	40.4.1. Overheating of compressor's casing draining line leading to More Temperature to Closed Drain and possible overheating.	40.4.1.1. TZA_111 high high temperature interlock to close ESDV-109 on discharge line to close drain.		
		40.5. Temperature More in compressor QA-K-8001A bearing due to loss of lube. oil.	40.5.1. Overheating to compressor bearing leading to compressor damage.	40.5.1.1. TZA-110 high high temperature interlock to stop the compressor.		
Less	41. Lower Temperature	41.1. Failure of TIC107 putting to maximum speed QA-E-8001A	41.1.1. Increased gas subcooling leading to increased condensate production and possible hydrate formation.	41.1.1.1. TZA113A low low temperature interlock to stop the fans of QA-E-8001A		
		41.2. Low flow of process gas	41.2.1. Same As 41.1.1			
		41.3. Depressurization of compressor train QA-K-8001A	41.3.1. Reduction of temperature due to gas depressurization leading to no significant consequences	41.3.1.1. The compressor train design temperature is equal to minimum temperature due to depressurization	11. SOLAR to confirm/highlight that compressor can handle a minimum temperature of -40° C	SOLAR
		41.4. Low ambient temperature.	41.4.1. Possible condensate / hydrates formation in the inlet line of PSV114A/B	41.4.1.1. Inlet line of PSV114A/B is sloped to main suction line in order to drain the condensate.	:Refer To 2	
			41.4.2. Possible wax formation in the compressor casing...	41.4.2.1. Heat tracing in the compressor casing discharge...		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less (cont.)	41. Lower Temperature (cont.)	41.4. Low ambient temperature. (cont.)	...discharge line to closed drain.	...line to close drain.		

Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	42. Higher Pressure	42.1. Pressure More from suction header (#01) 42.2. Refer To 35.4, 35.5, 35.6, 35.7. (condition of blocked outlet) 42.3. External fire	42.1.1. Overpressurization of QA-K-8001A discharge line leading to mechanical damage 42.2.1. Same As 42.1.1 42.3.1. Over pressurization of QAE-8001A	42.1.1.1. high pressure alarm in PI109 42.1.1.2. PI110 high high pressure interlock to stop the compressor QA-K-8001A 42.2.1.1. Same As 42.1.1.1, 42.1.1.2 42.2.1.2. PSV114A sized for blocked outlet scenario 42.3.1.1. Availability of BDV-101 for compressor circuit depressurization.		
Less/...	43. Less/ Vacuum...	43.1. Refer To 35.1 (No flow in...	43.1.1. Compressor QA-K-...	43.1.1.1. Compressor QA-K-...		

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Company: KPC
Facility: QASR Compressor station

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Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
...Vacuum	...Pressure	...compressor suction line)	<p>...8001A Surge leading to possible mechanical damage.</p> <p>43.1.2. Partial loss of production</p> <p>43.1.3. Increase of pressure in the existing facility.(Suction side)</p> <p>43.1.4. Possible conditions of vacuum in compressor QA-K-8001A suction header</p>	<p>...8001A equipped with anti-surge Control system.</p> <p>43.1.1.2. PI110 low low pressure interlock to stop compressor QA-K-8001A</p> <p>43.1.2.1. Spare compressor train</p> <p>43.1.3.1. Existing facility is equipped with proper safeguard against high pressure</p> <p>43.1.4.1. QA-V-8001A is sized for Full Vacuum.</p>	<p>12. Check if piping in compressor suction circuit can handle full vacuum condition.</p>	ENPPI

Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	44. Higher Level	44.1. Failure closed of LV108	44.1.1. Overfilling of compressor QA-K-8001A casing leading to potential mechanical damage to...	44.1.1.1. LZA110 high high level interlock to stop/inhibit starting of the compressor.	13. Add the LZA110 to cause and effect diagram.	ENPPI

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Company: KPC
Facility: QASR Compressor station

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Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	44. Higher Level (cont.)	44.1. Failure closed of LV108 (cont.)	...compressor	44.1.1.1. LZA110 high high level interlock to stop/inhibit starting of the compressor. (cont.)	13. Add the LZA110 to cause and effect diagram. (cont.)	
		44.2. Spurious closure of ESDV109	44.2.1. Same As 44.1.1	44.2.1.1. ESDV 109 is equipped with limit switch with alarm in DCS		
No/ Less	45. No/ Less Level	45.1. Failure open of LV108	45.1.1. Emptying of compressor QA-K-8001A casing leading to more pressure to closed drain drum (#22), and possible release of flammable gas to cold vent stack.	45.1.1.1. LZA109 low low level interlock to close ESDV109 45.1.1.2. Cold vent stack is provided with flame arrestor.		

Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	46. Different Composition	46.1. Different composition from existing facility (Suction)	46.1.1. Possible reduction of compressor efficiency leading to operational issues			
		46.2. Refer To 41.1., 41.3, 41.4 (Less Temperature)				

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	47. Others Maintenance	<p>47.1. Periodic maintenance of compressor train QA-K-8001A</p> <p>47.2. Improper maintenance of compressor circuit</p>	<p>47.1.1. Need to isolate, drain, vent, purge the compressor train QA-K-8001A</p> <p>47.1.2. Turbine wash 500 lit./unit/year</p> <p>47.2.1. Possible ignition of flammable substance leading to a fire.</p>	<p>47.1.1.1. Availability of fixed devices for isolation venting & draining. High point vent and low point drains to be provided for line .</p> <p>47.1.1.2. Provision for utility station for nitrogen purging.</p> <p>47.1.2.1. Availability of fixed circuit to recover the washing water and send it to waste disposal.(Refer to HAZID action #17)</p> <p>47.2.1.1. Compressor and Gas Tubine is installed in a dedicated enclosure provided with fire and gas detection and fire fighting svstem.(Refer to HAZID action # 28)</p>		

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Company: KPC
Facility: QASR Compressor station

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Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	48. Other	48.1. Low ambient temperature leading to condensate in fuel gas line.	48.1.1. Delayed ignition/start up and possible damage to fuel control valve.	48.1.1.1. Availability of superheaters and KO drum in the fuel gas circuit. 48.1.1.2. Fuel gas line is thermally insulated.		

Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	49. Failure Utility	49.1. Loss of electrical power	49.1.1. Possible loss of process control 49.1.2. Stop of lube. oil pump. 49.1.3. Closure of fuel gas control valve inside the turbine. 49.1.4. Stop the compressor QA-K-8001A.	49.1.1.1. Battery Recharger provided as backup for compressor control system . 49.1.2.1. Spare battery operated pump to ensure safe cool down of the turbine (4 hours). 49.1.3.1. Battery Recharger provided as backup for compressor control system .		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure (cont.)	49. Failure Utility (cont.)	49.2. Loss of instrument air	49.2.1. Spurious closure of ESDV 102A, ESDV032A, ESDV033A	49.2.1.1. ESDV 102A, ESDV032A, ESDV033A equipped with limit switches with alarm in DCS		
			49.2.2. Closure of fuel gas primary and secondary valves leading to turbine shutdown.	49.2.2.1. Low pressure alarm in instrument air inlet line inside SOLAR package.		
			49.2.3. Possible damage of dry gas seal and bearing and possible fire.	49.2.3.1. Differential pressure measure across the dry gas seal with alarm and turbine trip inside SOLAR package. 49.2.3.2. Compressor and Gas Turbine is installed in a dedicated enclosure provided with fire and gas detection and fire fighting system.		
			49.2.4. Possible release of flammable gas from turbine vent.	49.2.4.1. Turbine vent equipped with flame arrestor.		
		49.3. Loss of fuel gas.	49.3.1. Stop of the compressor QA-K_8001A .			
		49.4. Loss of nitrogen	49.4.1. Inefficiency of the compressor QA-K-8001A secondary seal leading to possible flammable vent to atmosphere.	49.4.1.1. Secondary seal vent equipped with flame arrestor.		
		49.5. Loss of seal gas	49.5.1. Inefficiency of the...	49.5.1.1. Differential pressure...		

Worksheet

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Facility: QASR Compressor station

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Session: (5) 24/07/2013

Node: (3A) Compressor Train A QA-K-8001 A (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 A (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg)

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure (cont.)	49. Failure Utility (cont.)	49.5. Loss of seal gas (cont.) 49.6. Loss of Lube. oil.	...compressor QA-K-8001A primary seal leading to possible flow of flammable gas to primary seal vent. 49.6.1. Mechanical damage of the compressor /Turbine shaft.	...measure across the dry gas seal with alarm and turbine trip inside SOLAR package. 49.6.1.1. Main lube. oil pump is driven by the turbine shaft 49.6.1.2. AC pump dedicated to prestart up and post shutdown lubrication. 49.6.1.3. Backup DC pump wiht different header to the bearings. 49.6.1.4. Low level alarm and trip in the lube. oil tank . 49.6.1.5. Low pressure alarm and trip in lube. oil header.		

Worksheet

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Facility: QASR Compressor station

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Session: (7) 28/07/2013

Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	50. No/ Less Flow (gas)	<p>50.1. Stop of compressor QA-K-8001A (#03A)</p> <p>50.2. Spurious closure of ESDV102A in discharge of compressor</p> <p>50.3. Spurious closure of ESDV032A upstream T106</p>	<p>50.1.1. No significant consequences in this node.</p> <p>50.1.2. Increase of pressure in the upstream existing facility.</p> <p>50.2.1. More Pressure in QA-V-8002A leading to mechanical damage.</p> <p>50.3.1. Same As 35.4.1</p>	<p>50.1.2.1. Existing facility is equipped with proper safeguard against high pressure</p> <p>50.2.1.1. ESDV 102A is equipped with limit switch with alarm in DCS</p> <p>50.2.1.2. Compressor QA-K-8001A is equipped with an antisurge controller opening FV103.</p> <p>50.2.1.3. PSV114A sized for blocked outlet scenario</p> <p>50.2.1.4. High pressure alarm on PI112</p> <p>50.2.1.5. PI111 high high pressure interlock to stop compressor QA-K-8001A</p> <p>50.3.1.1. ESDV 032A is equipped with limit switch with alarm in DCS</p> <p>50.3.1.2. Same As 35.4.1.2, 35.4.1.3, 35.4.1.4</p>		

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Company: KPC
Facility: QASR Compressor station

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Session: (7) 28/07/2013

Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	50. No/ Less Flow (gas) (cont.)	50.4. Spurious closure of ESDV033A upstream T104	50.4.1. Same As-35.4.1	50.4.1.1. ESDV 033A is equipped with limit switch with alarm in DCS		
				50.4.1.2. Same As-35.4.1.2, 35.4.1.3, 35.4.1.4		
		50.5. Demister Partial Blockage	50.5.1. Same As-35.4.1	50.5.1.1. Same As-35.4.1.2, 35.4.1.3, 35.4.1.4		
				50.5.1.2. Design pressure of QA- V-8002A is suitable for maximum discharge pressure of QA-K-8001A		
				50.5.1.3. PDI 122 High Alarm across demister		
			50.5.2. increasing pressure inside the vessel QA-V-8002A	50.5.2.1. Same As-16.1.1.1, 16.1.2.1		
		50.6. Failure close of PV-001	50.6.1. More Pressure in QA-V- 8002A /B/C/D leading to mechanical damage.	50.6.1.1. Compressor QA-K- 8001A is equipped with an antisurge controller opening FV103.		
				50.6.1.2. PSV114A sized for blocked outlet scenario		
				50.6.1.3. High pressure alarm on PI112		

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Company: KPC
Facility: QASR Compressor station

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Session: (7) 28/07/2013

Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	50. No/ Less Flow (gas) (cont.)	50.6. Failure close of PV-001 (cont.)	50.6.1. More Pressure in QA-V-8002A /B/C/D leading to mechanical damage. (cont.)	50.6.1.4. PI111 high high pressure interlock to stop compressor QA-K-8001A		
		50.7. Failure close of PV-002	50.7.1. Same As-50.6.1			
More	51. More Flow (gas)	51.1. Shutdown of the other compressor train	51.1.1. No significant consequences in this node			
		51.2. Failure open of PV-001	51.2.1. No significant consequences.			
		51.3. Failure open of PV-002	51.3.1. More pressure to Salam pipeline.	51.3.1.1. Salam pipeline and facilities equipped with proper safeguards against high pressure.		
Reverse	52. Reverse Flow (gas)	52.1. Stop of compressor QA-K-3001A (#03A)	52.1.1. Possible Reverse Flow from discharge header to compresor QA-K-3001A	52.1.1.1. Check valve downstream QA-V-8002A (dual plate waver type). 52.1.1.2. Compressor shutdown activates isolation of the compressor circuit and enclosure ESD-102A. 52.1.1.3. Compressor QA-K-8001A is equipped with an antisurge controller opening FV103.		

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Session: (7) 28/07/2013

Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Flow

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Company: KPC
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Session: (7) 28/07/2013

Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	53. Misdirected Flow (gas) (cont.)	<p>53.1. Spurious Opening of BDV101 (cont.)</p> <p>53.2. Partial leaking of PSV 118A/B</p> <p>53.3. Spurious opening of BDV011 on main compression unit discharge header</p>	<p>...hydrate formation in the flare header .</p> <p>53.2.1. Unexpected flaring</p> <p>53.2.2. Loss of production</p> <p>53.2.3. Possible condensate / Hydrates formation vent line downstream PSV118A/B</p> <p>53.3.1. Unexpected flaring</p> <p>53.3.2. Production losses</p> <p>53.3.3. Less pressure in the discharge header.</p> <p>53.3.4. Less Temperature in HP flare header, leading to possible hydrate formation in the flare header .</p>	<p>53.1.3.2. Availability of methanol injection in the flare header.</p> <p>53.2.1.1. Operating and maintenance procedures</p> <p>53.3.1.1. BDV 011 is equipped with limit switch with alarm in DCS</p> <p>53.3.1.2. BDV 011 is equipped air accumulator to allow three strokes in case of instrument air failure.</p> <p>53.3.2.1. Same As 53.3.1.1., 53.3.1.2</p> <p>53.3.3.1. Same As 53.3.1.1., 53.3.1.2</p> <p>53.3.4.1. Same As 53.3.1.1., 53.3.1.2</p> <p>53.3.4.2. Availability of methanol...</p>	:Refer To 2	

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Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	53. Misdirected Flow (gas) (cont.)	53.3. Spurious opening of BDV011 on main compression unit discharge header (cont.)	53.3.4. Less Temperature in HP flare header, leading to possible hydrate formation in the flare header . (cont.)	...injection in the flare header.		
		53.4. Spurious opening of ESDV-041 (on bypass line of PV-001)	53.4.1. More flow to Shams pipeline	53.4.1.1. ESDV 041 is equipped with limit switches (with alarm in DCS)		
		53.5. Spurious opening of ESDV-042 (on bypass line of PV-002)	53.5.1. More flow to Salam pipeline.	53.5.1.1. ESDV 042 is equipped with limit switches (with alarm in DCS)		
No/ Less	54. No/ Less Flow (condensate)	54.1. Spurious closure of ESDV 104	54.1.1. More Level in QA-V-8002A	54.1.1.1. ESDV 104 is equipped with limit switches (with alarm in DCS)		
		54.2. Failure close of LV 105	54.2.1. Same As-20.1.1	54.2.1.1. LV 105 is equipped with limit switches (with alarm in DCS)		
		54.3. Manual valves in the condensate outlet line of QA-V-8002A closed due to misoperation	54.3.1. Same As-20.1.1	54.3.1.1. Operating procedures		
		54.4. Partial blockage of check valve in discharge line of QA-V-8002A due to mechanical damage .	54.4.1. Same As-20.1.1			

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Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	55. More Flow (condensate)	55.1. Failure open LV105	55.1.1. Less level in QA-V-8002A	55.1.1.1. LV 105 is equipped with limit switches (with alarm in DCS)		
Reverse	56. Reverse Flow (condensate)	56.1. More pressure from QA-V-8002B/C/D	56.1.1. Possible back flow of gas from QA-V-8002B/C/D to QA-V-8002A	56.1.1.1. Check valve in the QA-V-8001A discharge line		
Misdirected	57. Misdirected Flow (condensate)	57.1. Manual valve in the methanol injection line left open due misoperation	57.1.1. Increase of methanol consumption.	57.1.1.1. Availability of normally close double block and bleed connection.		
			57.1.2. Possible reverse gas flow to methanol circuit.	57.1.2.1. Availability of normally close double block and bleed connection. 57.1.2.2. Availability of two check valves.		

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Session: (7) 28/07/2013

Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	58. Higher Temperature	58.1. Refer To 40.1., 40.2, 40.3 (More Temperature in #03A)				
Less	59. Lower Temperature	59.1. Refer To 41.1., 41.3 (Less Temperature in #03A)				
		59.2. Depressurization of main compressor unit discharge header	59.2.1. Less Temperature in main compressor unit discharge header	59.2.1.1. Low temperature alarm on TI033 59.2.1.2. Design temperature on main compressor unit discharge header is equal to minimum temperature due to depressurization		
		59.3. Low ambient temperature.	59.3.1. Possible condensate / hydrates formation in the inlet line of PSV118A/B 59.3.2. Possible condensate / hydrates formation in the inlet line of FV-103 (antisurge valve). 59.3.3. Possible wax formation in the condensate discharge line 59.3.4. Possible wax formation in the level instrument connections, leading to operating problems.	59.3.1.1. Inlet line of PSV118A/B is sloped to main suction line in order to drain the condensate. 59.3.2.1. Inlet line of FV-103 is sloped to QA-V-8002A in order to drain the condensate. 59.3.3.1. Heat tracing in the condensate line. 59.3.4.1. Availability of heat tracing for level instruments of all condensate drums.	:Refer To 2 16. Check the availability of proper slope from FV-104 to QA-V-8002A.	ENPPI

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Session: (7) 28/07/2013

Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	60. Higher Pressure	<p>60.1. Refer To 42.1., 42.2 (More Pressure in #03A)</p> <p>60.2. External fire</p> <p>60.3. Blockage of temporary strainer upstream node FV-103.</p>	<p>60.2.1. Overpressurization of QA-V-8002A leading to mechanical damage</p> <p>60.3.1. Possible incorrect activation of antisurge system.</p>	<p>60.2.1.1. PSV118A/B sized for fire scenario</p> <p>60.3.1.1. The strainer is installed only during commissioning (constantly manned operation).</p>	<p>17. SOLAR to confirm if the presence of temporary strainer upstream FV-103 is suitable for the compressor design and if differential pressure signal to control panel is required.</p>	SOLAR
Less/ Vacuum	61. Less/ Vacuum Pressure	61.1. Stop of compressor QA-K-8001A	61.1.1. Less Pressure in the main compressor unit discharge header leading to Possible Reverse Flow	61.1.1.1. Check valve downstream QA-V-8002A		

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Company: KPC
Facility: QASR Compressor station

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Session: (7) 28/07/2013

Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	62. Higher Level	62.1. Spurious closure of ESDV 104	62.1.1. Overfilling of QA-V-8002A leading to liquid carry over to main compressor unit discharge header and to existing export pipeline with possible hammering.	62.1.1.1. ESDV 104 is equipped with limit switches with alarm in DCS. 62.1.1.2. LZA 104B High High level Interlock for compressor QA-K-8001A shut down 62.1.1.3. LIC 105 with high level alarm.		
		62.2. Failure close of LV 105	62.2.1. Same As-62.1.1	62.2.1.1. LV 105 is equipped with limit switches (with alarm in DCS) 62.2.1.2. Same As-62.1.1.2		
		62.3. Manual valves in the condensate outlet line of QA-V-8001A closed due to misoperation	62.3.1. Same As-62.1.1	62.3.1.1. Operating procedures. 62.3.1.2. Same As-62.1.1.2		
		62.4. Spurious closure of ESDV017, ESDV018, ESDV019, ESDV020, ESDV021 in the existing facility	62.4.1. Same As-62.1.1.	62.4.1.1. ESDV017, ESDV018, ESDV019, ESDV020, ESDV021 equipped with limit switches with alarm in DCS.		
No/ Less	63. No/ Less Level	63.1. Failure open of LV 105	63.1.1. Gas blow by to the production separators in existing facilities leading to more pressure.	63.1.1.1. LZA 104A low low level Interlock to close the shutdown valve ESDV 104 on liquid discharge line.		

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Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	63. No/ Less Level (cont.)	63.1. Failure open of LV 105 (cont.)	63.1.1. Gas blow by to the production separators in existing facilities leading to more pressure. (cont.)	63.1.1.2. LV 105 is equipped with limit switches (with alarm in DCS). 63.1.1.3. The design pressure of the existing facility is consistent with design QA-V-8002 A. 63.1.1.4. Existing facility is provided by a high pressure safeguard.		

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Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	64. Different Composition 65. Deposition	64.1. Different composition from existing facility 64.2. Refer To 41.1., 41.3, 41.4 (Less Temperature) 65.1. Refer To 41.1., 41.3, 41.4 (Less Temperature)	64.1.1. No significant consequences in this node			

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Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	66. Others Maintenance	66.1. Periodic maintenance of compressor train QA-K-8001A	66.1.1. Need to isolate, drain, vent, purge the compressor train QA-K-8001A	66.1.1.1. Availability of fixed devices for isolation venting & draining. High point vent and low point drains to be provided for line . 66.1.1.2. Provision for utility station for nitrogen purging.		
		66.2. Corrosion issues.	66.2.1. Possible corrosion of QA-V-8002 A.	66.2.1.1. QA-V-8002 A is stainless steel cladded. 66.2.1.2. QA-V-8002 A internals are stainless steel.		

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Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	67. Other	67.1. Incorrect opening of ESDV 102 A during start up.	67.1.1. Possible hammering in down stream piping leading to potential mechanical damage .	67.1.1.1. PDZA 102 to inhibit the opening of main line valve (ESDV102A) if the differential pressure exceeds 2 bar.		

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Node: (4A) Compressor "A" discharge separator: Compressor Discharge Drum Train A QA-V-8002 A (OT: 58°C; OP:123 barg)

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	68. Failure Utility	68.1. Loss of electrical power	68.1.1. Possible loss of process control	68.1.1.1. UPS provided as backup for all control system .		
		68.2. Loss of instrument air	68.2.1. Spurious closure of ESDV 102A, ESDV032A, ESDV033A	68.2.1.1. ESDV 102A, ESDV032A, ESDV033A equipped with limit switches with alarm in DCS		
			68.2.2. Spurious closure of ESDV017, ESDV018, ESDV019, ESDV020, ESDV021 in the existing facility	68.2.2.1. ESDV017, ESDV018, ESDV019, ESDV020, ESDV021 equipped with limit switches with alarm in DCS.		

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	69. No/ Less Flow (gas)	<p>69.1. Manual valves in the suction line of QA-V-8001 B closed due to misoperation</p> <p>69.2. Compressor QA-K-8001A failure (#02A)</p> <p>69.3. Spurious closure of ESDV 102A (#4A)</p> <p>69.4. Failure close of PV 223</p> <p>69.5. Demister Partial Blockage</p>	<p>69.1.1. Compressor QA-K-8001B Surge leading to possible mechanical damage(#03A) .</p> <p>69.1.2. Partial loss of production</p> <p>69.1.3. More Pressure in compressor QA-K-8001A (#03A).</p> <p>69.2.1. Same As 69.1.1, 69.1.2, 69.1.3</p> <p>69.3.1. Same As 69.1.1, 69.1.2, 69.1.3</p> <p>69.4.1. Same As 69.1.1, 69.1.2, 69.1.3</p> <p>69.5.1. Same As 69.1.1, 69.1.2, 69.1.3</p>	<p>69.1.1.1. Compressor QA-K-8001B equipped with anti-surge Control system (Node 03A)</p> <p>69.1.2.1. Spare compressor train</p> <p>69.1.3.1. Refer to More Pressure safeguards in (#03A)</p> <p>69.2.1.1. Same As 69.1.1.1</p> <p>69.3.1.1. ESDV 102A is equipped with limit switches (with alarm in DCS)</p> <p>69.3.1.2. ESDV102A to be kept open during the series operation</p> <p>69.3.1.3. Same As 69.1.1.1 & 69.1.2.1</p> <p>69.4.1.1. Same As 69.1.1.1 & 69.1.2.1</p> <p>69.5.1.1. Same As 69.1.1.1, 69.1.2.1</p>	<p>18. Verify the possibility to configure PV223 in suction of compressor train B as fail open.</p>	ENNPI/ SOLAR

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	69. No/ Less Flow (gas) (cont.)	69.5. Demister Partial Blockage (cont.)	69.5.1. Same As 69.1.1, 69.1.2, 69.1.3 (cont.)	69.5.1.2. Design pressure of QA- V-8001B is suitable for maximum suction pressure from existing facility 69.5.1.3. PDI 221 High Alarm across demister	19. Provide high alarm on PDIT 208 across temporary strainer	ENPPI
			69.5.2. increasing pressure inside the vessel QA-V-8001B	69.5.2.1. Same As 69.1.1.1, 69.1.2.1.		
		69.6. Temporary strainer blockage in the suction line of compressor QA-K-8001B	69.6.1. Same As 69.1.1, 69.1.2, 69.1.3, 69.5.2	69.6.1.1. Same As 69.1.1.1, 69.1.2.1.		
		69.7. Partial blockage of check valve upstream QA-V-8001B due to mechanical damage .	69.7.1. Same As 69.1.1, 69.1.2, 69.1.3	69.7.1.1. Same As 69.1.1.1, 69.1.2.1. 69.7.1.2. Non slam check valve		
More	70. More Flow (gas)	70.1. Shutdown of the other compressor train	70.1.1. Possible production losses 70.1.2. Pressure More in upstream existing facility			
Reverse	71. Reverse Flow (gas)	71.1. Compressor QA-K-8001B (#03B) operating in fully recycle mode	71.1.1. Possible back flow of the compressed gas to the suction line leading to increase of pressure in QA-K-8001A.	71.1.1.1. Check valve upstream QA-V-8001B		

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected	72. Misdirected Flow (gas)	72.1. Partial leaking of PSV 205 A/B	72.1.1. Unexpected flaring 72.1.2. Loss of production 72.1.3. Possible condensate / Hydrates formation vent line downstream PSV205A/B	72.1.1.1. Operating and maintenance procedures	:Refer To 2	
		72.2. Failure open of ESDV-201A while working on series.	72.2.1. Possible gas back flow to suction inlet manifold leading to pressure rise.	72.2.1.1. Lines not in service while working on series operation, are isolated with double blocking bleed manual valves & blind.		
No/ Less	73. No/ Less Flow (condensate)	73.1. Spurious closure of ESDV 203	73.1.1. More Level in QA-V-8001B	73.1.1.1. ESDV a03 is equipped with limit switches (with alarm in DCS)		
		73.2. Failure close of LV 202B	73.2.1. Same As-73.1.1	73.2.1.1. LV 202B equipped with limit switches (with alarm in DCS)		
		73.3. Manual valves in the condensate outlet line of QA-V-8001B closed due to misoperation	73.3.1. Same As-73.1.1	73.3.1.1. Operating procedures		
		73.4. Partial blockage of check valve in discharge line of QA-V-8001B due to mechanical damage .	73.4.1. Same As-73.1.1			

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	74. More Flow (condensate)	74.1. Failure open LV202A/B	74.1.1. Less level in QA-V-8001A	74.1.1.1. LV 202A/B is equipped with limit switches (with alarm in DCS)		
Reverse	75. Reverse Flow (condensate)	75.1. More pressure QA-V-8005A (#5B)	75.1.1. Possible back flow of gas from QA-V-8005A to QA-V-8001B	75.1.1.1. Check valve in the QA-V-8001B discharge line		
Misdirected	76. Misdirected Flow (condensate)	76.1. Manual valve in the methanol injection line left open due misoperation	76.1.1. Increase of methanol consumption.	76.1.1.1. Availability of normally close double block and bleed connection.		

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	77. Higher Temperature	77.1. More Temperature from QA-V-8002A (#04A)	77.1.1. Increase of temperature in suction line leading to no significant consequences in this node 77.1.2. More Temperature in compressor QA-K-8001B discharge (# 03B).	77.1.1.1. Design temperature of suction line is consistent of existing facility design temperature.		

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less	78. Lower Temperature	78.1. Low ambient temperature.	78.1.1. Possible condensate / hydrates formation in the inlet line of PSV205A/B 78.1.2. Possible wax formation in the condensate discharge line 78.1.3. Possible wax formation in the level instrument connections, leading to operating problems.	78.1.1.1. Inlet line of PSV205A/B is sloped to main suction line in order to drain the condensate. 78.1.2.1. Heat tracing in the condensate line. 78.1.3.1. Availability of heat tracing for level instruments of all condensate drums.	:Refer To 2 :Refer To 5	 ENPPI

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	79. Higher Pressure	79.1. Demister of QA-V-8001B partial blockage 79.2. The strainer blockage in the suction line	79.1.1. Increase of the pressure in QA-V-8001B below design pressure 79.2.1. Same As 79.1.1	79.1.1.1. QA-V-8001B design pressure is the same of the compressor design pressure QA-K-8001B		

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	79. Higher Pressure (cont.)	79.3. Compressor trip QA-K-8001B 79.4. External fire .	79.3.1. Same As 79.1.1 79.4.1. Over pressurization of QA-V-8001B leading to mechanical damage	79.4.1.1. PSV 205A/B sized for fire case.		
Less/ Vacuum	80. Less/ Vacuum Pressure	80.1. ESDV201A spurious closure	80.1.1. possible vacuum condition in QA-V-8001B	80.1.1.1. QA-V-8001B is designed for F.V.		

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	81. Higher Level	81.1. Spurious closure of ESDV 203	81.1.1. Overfilling of QA-V-8001A leading to liquid carry over to the compressor QA-K-8001A with possible mechanical damage(#03A).	81.1.1.1. ESDV 203 is equipped with limit switches (with alarm in DCS). 81.1.1.2. LZA 207 (High High) Interlock for compressor QA-K-8001B shut down 81.1.1.3. LIC 202 with high level...		

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	81. Higher Level (cont.)	81.1. Spurious closure of ESDV 203 (cont.)	81.1.1. Overfilling of QA-V-8001A leading to liquid carry over to the compressor QA-K-8001A with possible mechanical damage(#03A). (cont.)	...alarm.		
		81.2. Failure close of LV 202A/B	81.2.1. Same As 81.1.1	81.2.1.1. LV 202A/B is equipped with limit switches (with alarm in DCS) 81.2.1.2. Same As 81.1.1.2		
		81.3. Manual valves in the condensate outlet line of QA-V-8001B closed due to misoperation	81.3.1. Same As 81.1.1	81.3.1.1. operating procedures. 81.3.1.2. Same As 81.1.1.2		
No/ Less	82. No/ Less Level	82.1. Failure open of LV 202A/B	82.1.1. Gas blow by to the condensate suction drum QA-V-8005A (#05B)	82.1.1.1. LZA 201 (low low) Interlock to close the shutdown valve ESDV 203 on liquid discharge line.		

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	83. Different Composition	83.1. Level More in QA-V-8002A (#04A)	83.1.1. condensate carry over to QA-V-8001B leading to More Level in QA-V-8001B	83.1.1.1. Refer to More Level safeguards		
	84. Deposition	84.1. Refer To 78.1 (Low ambient temperature)				

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	85. Others Maintenance	85.1. Periodic gas sampling	85.1.1. The operator needs to reach the new sample connection located downstream QA-V-8001A (Gas Phase)		20. Check sample connection downstream QA-V-8001B to be located in accessible location for operator during 3D model review .	ENPPI
		85.2. Periodic maintenance	85.2.1. Need for isolation venting , draining and purging of the QA-V-8001B.	85.2.1.1. Availability of fixed devices for isolation venting & draining . High point vent and low point drains to be provided for...		

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others (cont.)	85. Others Maintenance (cont.)	85.2. Periodic maintenance (cont.) 85.3. Maintenance of LV 202A/B 85.4. Corrosion issues	85.2.1. Need for isolation venting , draining and purging of the QA-V- 8001B. (cont.) 85.3.1. Needs to operate by-pass line of LV 202A/B 85.4.1. No Significant consequences	...line . 85.2.1.2. Provision for utility station for nitrogen purging. 85.4.1.1. Corrosion is not expected in accordance with selected piping material.	21. Add a note in all applicable P&IDs that the level gauge of all condensate drums shall be visible from manual valve of by- pass line of relevant level control valve installed on liquid discharge line.	ENPPI

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	86. Other	86.1. Incorrect opening of ESDV 201 A during start up.	86.1.1. Possible hammering in down stream piping leading to potential mechanical damage .	86.1.1.1. PDZA 101 to inhibit the opening of main line valve ESDV201A if the differential pressure exceeds 2 bar. 86.1.1.2. The opening of ESDV201B is operated with the compressor train A in full recycle		

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Node: (2B) Compressor "B" suction including Compressor Suction Drum Train B QA-V-8001 B (OT: 57.2°C; OP: 35.9 barg) when working downstream Train "A"

Intention: Condensate separation

Drawings: 3538-200-KKD-12211

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12250

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	87. Failure Utility	87.1. Loss of electrical power 87.2. Loss of instrument air	87.1.1. Possible loss of process control 87.2.1. Spurious closure of ESDV 201 A/B, ESDV203	87.1.1.1. UPS provided as backup for all control system . 87.2.1.1. ESDV 201 A/B, ESDV 203 equipped with limit switch (with alarm in DCS)		

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	88. No/ Less Flow	<p>88.1. No Flow from QA-V-8001B (#02B)</p> <p>88.2. Stop of compressor QA-K-8001B</p> <p>88.3. Failure of speed controller reducing the speed</p> <p>88.4. Spurious closure of ESDV202A in discharge of compressor (#04B)</p>	<p>88.1.1. Compressor QA-K-8001B Surge leading to possible mechanical damage.</p> <p>88.1.2. Partial loss of production</p> <p>88.2.1. Increase of pressure in the existing facility.</p> <p>88.3.1. Increase of pressure in the existing facility.(suction)</p> <p>88.3.2. Less pressure in the discharge of the compressor.</p> <p>88.4.1. More Pressure in QA-K-8001B discharge line.</p>	<p>88.1.1.1. Compressor QA-K-8001B equipped with anti-surge Control system,operating anti surge valve FV203</p> <p>88.1.1.2. PI110 low low pressure interlock to stop compressor QA-K-8001B</p> <p>88.1.2.1. Spare compressor train</p> <p>88.2.1.1. Existing facility is equipped with proper safeguard against high pressure</p> <p>88.3.1.1. Low speed alarm SIT-101</p> <p>88.4.1.1. ESDV 202A is equipped with limit switch with alarm in DCS</p> <p>88.4.1.2. PSV214A/B sized for blocked outlet scenario</p> <p>88.4.1.3. High pressure alarm on PI212</p>	<p>:Refer To 8</p> <p>22. SOLAR to check the presence of low speed alarm on SIT-201</p>	SOLAR

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	88. No/ Less Flow (cont.)	<p>88.4. Spurious closure of ESDV202A in discharge of compressor (#04B) (cont.)</p> <p>88.5. Spurious closure of ESDV032A upstream TI06</p> <p>88.6. Spurious closure of ESDV033A upstream TI04</p> <p>88.7. Manual valves on QA-E-8001B left closed due to misoperation</p> <p>88.8. Partial blockage of a check valve downstream QA-V-8002B (#04B)</p> <p>88.9. Partial blockage of demister of QA-V-8002A (#04B)</p>	<p>88.4.1. More Pressure in QA-K-8001B discharge line. (cont.)</p> <p>88.5.1. Same As-88.4.1</p> <p>88.6.1. Same As-88.4.1</p> <p>88.7.1. Same As-88.4.1</p> <p>88.8.1. Same As-88.4.1</p> <p>88.9.1. Same As-88.4.1</p>	<p>88.4.1.4. PI111 high high pressure interlock to stop compressor QA-K-8001B</p> <p>88.5.1.1. ESDV 032A is equipped with limit switch with alarm in DCS</p> <p>88.5.1.2. Same As-88.4.1.2, 88.4.1.3, 88.4.1.4</p> <p>88.6.1.1. ESDV 033A is equipped with limit switch with alarm in DCS</p> <p>88.6.1.2. Same As-88.4.1.2, 88.4.1.3, 88.4.1.4</p> <p>88.7.1.1. Same As-88.4.1.2, 88.4.1.3, 88.4.1.4</p> <p>88.7.1.2. Operating procedures</p> <p>88.9.1.1. high differential pressure alarm on PDI-222 across demister</p>		
More	89. More Flow	89.1. Shutdown of the other compressor train C/D during in series operation	89.1.1. Limited increase of compressor load leading to no significant consequences	89.1.1.1. High flow alarm in FI202		

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	89. More Flow (cont.)	89.2. Failure of speed controller increasing the speed	89.2.1. Possible overspeed of turbine leading to more pressure in the discharge	89.2.1.1. High speed alarm SIT-201 89.2.1.2. Overspeed interlock to shutdown the compressor by dedicated instrument.		
Reverse	90. Reverse Flow	90.1. Stop of compressor QA-K-3001B	90.1.1. Possible Reverse Flow from discharge header to compressor QA-K-3001B leading to possible mechanical damage.	90.1.1.1. Check valve downstream QA-V-8002b (#4A) 90.1.1.2. Anti-surge control loop for compressor. 90.1.1.3. In case of compressor QA-K-8001A shutdown , ESDV-102B is closed to isolate the circuit. (suction and discharge)		
Misdirected	91. Misdirected Flow	91.1. Spurious Opening of BDV201	91.1.1. Unexpected flaring 91.1.2. Pressure less in compressor discharge line. 91.1.3. Partial production losses	91.1.1.1. BDV 201 is equipped with limit switch with alarm in DCS 91.1.1.2. BDV 201 is equipped air accumulator to allow three strokes in case of instrument air failure. 91.1.3.1. Same As 91.1.1.1., 91.1.1.2		

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	91. Misdirected Flow (cont.)	<p>91.1. Spurious Opening of BDV201 (cont.)</p> <p>91.2. Partial leaking of PSV 214A/B</p> <p>91.3. QA-K-8001B dry gas seals failure</p>	<p>91.1.4. Less Temperature in HP flare header, leading to possible hydrate formation in the flare header .</p> <p>91.2.1. Unexpected flaring</p> <p>91.2.2. Loss of production</p> <p>91.2.3. Possible condensate / Hydrates formation vent line downstream PSV214A/B</p> <p>91.3.1. Possible misdirected flow of flammable gas to cold vent</p>	<p>91.1.4.1. Same As 91.1.1.1., 91.1.1.2</p> <p>91.1.4.2. Availability of methanol injection in the flare header.</p> <p>91.2.1.1. Operating and maintenance procedures</p> <p>91.3.1.1. Cold vent circuit (#20) is continuously flushed with nitrogen</p> <p>91.3.1.2. Cold vent stack is provided with flame arrester</p> <p>91.3.1.3. High flow interlock in compressor seal vent line to shutdown the compressor.</p>	:Refer To 2	
No/ Less	92. No/ Less Flow (vent seal)	92.1. Increase of back pressure flare header.	92.1.1. Possible damage of a dry gas seal.	92.1.1.1. PT-5167 to open AV-5167 to vent to safe location.	:Refer To 10	

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	93. Higher Temperature	93.1. Temperature More from QA-V-8001B (#2B)	93.1.1. More Temperature in the compressor QA-K-8001B discharge line leading to possible mechanical damage.	93.1.1.1. High temperature alarm on TI203 93.1.1.2. TI102 high high temperature interlock to stop the compressor QA-K-8001B		
		93.2. Failure of air cooler QA-E-8001B	93.2.1. More Temperature in QA-V-8002B (#04B) leading to possible mechanical damage	93.2.1.1. TZA208 (2oo3 redundant logic) high high temperature interlock to stop the compressor QA-K-8001B		
		93.3. Failure of TIC207 shutting down QA-E-8001B	93.3.1. Same As 93.2.1			
		93.4. Temperature More in compressor QA-K-8001B casing	93.4.1. Overheating of compressor's casing draining line leading to More Temperature to Closed Drain and possible overheating.	93.4.1.1. TZA high high temperature interlock to close ESDV-209 on discharge line to close drain.		
		93.5. Temperature More in compressor QA-K-8001B bearing due to loss of lube. oil.	93.5.1. Overheating to compressor bearing leading to compressor damage.	93.5.1.1. TZA-210 high high temperature interlock to stop the compressor.		
Less	94. Lower Temperature	94.1. Failure of TIC107 putting to maximum speed QA-E-8001B	94.1.1. Increased gas subcooling leading to increased condensate production and possible hydrate formation.	94.1.1.1. TZA213A low low temperature interlock to stop the fans of QA-E-8001B		
		94.2. Low flow of process gas	94.2.1. Same As 94.1.1			

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less (cont.)	94. Lower Temperature (cont.)	94.3. Depressurization of compressor train QA-K-8001B	94.3.1. Reduction of temperature due to gas depressurization leading to no significant consequences	94.3.1.1. The compressor train design temperature is equal to minimum temperature due to depressurization	:Refer To 11	
		94.4. Low ambient temperature.	94.4.1. Possible condensate / hydrates formation in the inlet line of PSV214A/B	94.4.1.1. Inlet line of PSV214A/B is sloped to main suction line in order to drain the condensate.	:Refer To 2	
			94.4.2. Possible wax formation in the compressor casing discharge line to closed drain.	94.4.2.1. Heat tracing in the compressor casing discharge line to close drain.		

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	95. Higher Pressure	95.1. Pressure More from suction header (#01)	95.1.1. Overpressurization of QA-K-8001B discharge line	95.1.1.1. high pressure alarm in PI209 95.1.1.2. PI110 high high pressure interlock to stop the compressor QA-K-8001B		
		95.2. Refer To 88.4, 88.5,...	95.2.1. Same As 95.1.1	95.2.1.1. Same As 95.1.1.1,...		

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	95. Higher Pressure (cont.)	...88.6, 88.7 (condition of blocked outlet)	95.2.1. Same As 95.1.1 (cont.)	...95.1.1.2 95.2.1.2. PSV214A sized for blocked outlet scenario		
		95.3. External fire	95.3.1. Over pressurization of QAE-8001B	95.3.1.1. Availability of BDV-201 for compressor circuit depressurization.		
Less/ Vacuum	96. Less/ Vacuum Pressure	96.1. Refer To 88.1 (No flow in compressor suction line)	96.1.1. Compressor QA-K-8001B Surge leading to possible mechanical damage.	96.1.1.1. Compressor QA-K-8001B equipped with anti-surge Control system. 96.1.1.2. PI210 low low pressure interlock to stop compressor QA-K-8001B		
			96.1.2. Partial loss of production	96.1.2.1. Spare compressor train		
			96.1.3. Increase of pressure in the existing facility.(Suction side)	96.1.3.1. Existing facility is equipped with proper safeguard against high pressure		
			96.1.4. Possible conditions of vacuum in compressor QA-K-8001B suction header	96.1.4.1. QA-V-8001B is sized for Full Vacuum.	23. Check if piping in compressor circuit can handle full vacuum condition.	ENPPI

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	97. Higher Level	97.1. Failure closed of LV208	97.1.1. Overfilling of compressor QA-K-8001B casing leading to potential mechanical damage to compressor	97.1.1.1. LZA210 high high level interlock to stop/inhibit starting of the compressor.	24. Add LZA210 to cause and effect diagram.	
		97.2. Spurious closure of ESDV209	97.2.1. Same As-97.1.1	97.2.1.1. ESDV 209 is equipped with limit switch with alarm in DCS		
No/ Less	98. No/ Less Level	98.1. Failure open of LV208	98.1.1. Emptying of compressor QA-K-8001B casing leading to more pressure to closed drain drum (#22), and possible release of flammable gas to cold vent stack.	98.1.1.1. LZA209 low low level interlock to close ESDV209 98.1.1.2. Cold vent stack is provided with flame arrestor.		

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	99. Different Composition	99.1. Different composition from existing facility (Suction)	99.1.1. Possible reduction of compressor efficiency leading to operational issues			
		99.2. Refer To 94.1., 94.3, 94.4 (Less Temperature)				

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	100. Others Maintenance	100.1. Periodic maintenance of compressor train QA-K-8001B	100.1.1. Need to isolate, drain, vent, purge the compressor train QA-K-8001B	100.1.1.1. Availability of fixed devices for isolation venting & draining. High point vent and low point drains to be provided for line . 100.1.1.2. Provision for utility station for nitrogen purging.		
			100.1.2. Turbine wash	100.1.2.1. Availability of fixed circuit to recover the washing water and send it to waste disposal. Estimate consumption equal to 500 lit./unit/year (Refer to HAZID action #17)		
		100.2. Improper maintenance of compressor circuit	100.2.1. Possible ignition of flammable substance leading to a fire.	100.2.1.1. Compressor and Gas Turbine is installed in a dedicated enclosure provided with fire and gas detection and fire fighting system.(Refer to HAZID action # 28)		

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	101. Other	101.1. Low ambient temperature leading to condensate in fuel gas line.	101.1.1. Delayed ignition/start up and possible damage to fuel control valve.	101.1.1.1. Availability of superheaters and KO drum in the fuel gas circuit. 101.1.1.2. Fuel gas line is thermally insulated.		

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	102. Failure Utility	102.1. Loss of electrical power	102.1.1. Possible loss of process control 102.1.2. Stop of lube. oil pump. 102.1.3. Closure of fuel gas control valve inside the turbine. 102.1.4. Stop the compressor QA-K-8001A.	102.1.1.1. Battery Recharger provided as backup for compressor control system . 102.1.2.1. Spare battery operated pump to ensure safe cool down of the turbine (4 hours). 102.1.3.1. Battery Recharger provided as backup for compressor control system .		

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure (cont.)	102. Failure Utility (cont.)	102.2. Loss of instrument air	102.2.1. Spurious closure of ESDV 202A, ESDV032A, ESDV033A	102.2.1.1. ESDV 202A, ESDV032A, ESDV033A equipped with limit switches with alarm in DCS		
			102.2.2. Closure of fuel gas primary and secondary valves leading to turbine shutdown.	102.2.2.1. Low pressure alarm in instrument air inlet line inside SOLAR package.		
			102.2.3. Possible damage of dry gas seal and bearing and possible fire.	102.2.3.1. Differential pressure measure across the dry gas seal with alarm and turbine trip inside SOLAR package.		
			102.2.4. Possible release of flammable gas from turbine vent.	102.2.3.2. Compressor and Gas Turbine is installed in a dedicated enclosure provided with fire and gas detection and fire fighting system. 102.2.4.1. Turbine vent equipped with flame arrestor.		
		102.3. Loss of fuel gas.	102.3.1. Stop of the compressor QA-K_8001B .			
		102.4. Loss of nitrogen	102.4.1. Inefficiency of the compressor QA-K-8001B secondary seal leading to possible flammable vent to atmosphere.	102.4.1.1. Secondary seal vent equipped with flame arrestor.		

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Node: (3B) Compressor Train B QA-K-8001 B (suction/ discharge OT: 174.5 °C; OP: 123.5 barg) and Compression Discharge Cooler QA-E-8001 B (inlet/ outlet OT: 174.5/58 °C; OP: 123 barg) when working downstream Train "A"

Intention: Compression and discharge cooling

Drawings: 3538-200-KKD-12212

3538-200-KKD-12213

3538-200-KKD-12214

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure (cont.)	102. Failure Utility (cont.)	102.5. Loss of seal gas 102.6. Loss of Lube. oil.	102.5.1. Inefficiency of the compressor QA-K-8001B primary seal leading to possible flow of flammable gas to primary seal vent. 102.6.1. Mechanical damage of the compressor /Turbine shaft.	102.5.1.1. Differential pressure measure across the dry gas seal with alarm and turbine trip inside SOLAR package. 102.6.1.1. Main lube. oil pump is driven by the turbine shaft 102.6.1.2. AC pump dedicated to prestart up and post shutdown lubrication. 102.6.1.3. Backup DC pump wiht different header to the bearings. 102.6.1.4. Low level alarm and trip in the lube. oil tank . 102.6.1.5. Low pressure alarm and trip in lube. oil header.		

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Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	103. No/ Less Flow (gas)	<p>103.1. Stop of compressor QA-K-8001B (#03B)</p> <p>103.2. Spurious closure of ESDV202A in discharge of compressor</p> <p>103.3. Spurious closure of ESDV032A upstream TI06</p> <p>103.4. Spurious closure of ESDV033A upstream TI04</p>	<p>103.1.1. Pressure Less leading to possible Flow Reverse</p> <p>103.1.2. Pressure More in QA-K-8001A discharge line (#03A)</p> <p>103.2.1. More Pressure in QA-V-8002B leading to mechanical damage.</p> <p>103.3.1. Same As-35.4.1</p> <p>103.4.1. Same As-35.4.1</p>	<p>103.1.2.1. Refer to More Pressure safeguards in #03A</p> <p>103.2.1.1. ESDV 202A is equipped with limit switch with alarm in DCS</p> <p>103.2.1.2. PSV214A sized for blocked outlet scenario</p> <p>103.2.1.3. High pressure alarm on PI212</p> <p>103.2.1.4. PI211 high high pressure interlock to stop compressor QA-K-8001A</p> <p>103.3.1.1. ESDV 032A is equipped with limit switch with alarm in DCS</p> <p>103.3.1.2. Same As-35.4.1.2, 35.4.1.3, 35.4.1.4</p> <p>103.4.1.1. ESDV 033A is equipped with limit switch with alarm in DCS</p>		

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Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	103. No/ Less Flow (gas) (cont.)	103.4. Spurious closure of ESDV033A upstream T104 (cont.)	103.4.1. Same As 35.4.1 (cont.)	103.4.1.2. Same As 35.4.1.2, 35.4.1.3, 35.4.1.4		
		103.5. Demister Partial Blockage	103.5.1. Same As 35.4.1	103.5.1.1. Same As 35.4.1.2, 35.4.1.3, 35.4.1.4 103.5.1.2. Design pressure of QA- V-8002A is suitable for maximum discharge pressure of QA-K-8001B 103.5.1.3. PDI 222 High Alarm across demister		
			103.5.2. increasing pressure inside the vessel QA-V-8001B	103.5.2.1. Same As 16.1.1.1, 16.1.2.1		
		103.6. Failure close of PV001 in existing downstream facility	103.6.1. XXX			
		103.7. Failure close of PV002 in existing downstream facility	103.7.1. XXX			
More	104. More Flow (gas)	104.1. Shutdown of the other compressor train	104.1.1. No significant consequences in this node			
		104.2. Failure open of PV001 in existing downstream facility	104.2.1. XXX			
		104.3. Failure open of PV002...	104.3.1. XXX			

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Facility: QASR Compressor station

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Session: (9) 30/07/2013

Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	104. More Flow (gas) (cont.)	...in existing downstream facility	104.3.1. XXX (cont.)			
Reverse	105. Reverse Flow (gas)	105.1. Stop of compressor QA-K-3001B (#03A)	105.1.1. Possible Reverse Flow from discharge header to compresor QA-K-3001B	105.1.1.1. Check valve downstream QA-V-8002B		
Misdirected	106. Misdirected Flow (gas)	106.1. Spurious Opening of BDV201	106.1.1. Unexpected flaring	106.1.1.1. BDV 201 is equipped with limit switch with alarm in DCS		
			106.1.2. Partial production losses	106.1.1.2. BDV 201 is equipped air accumulator to allow three strokes in case of instrument air failure.		
			106.1.3. Less Temperature in HP flare header, leading to possible hydrate formation in the flare header .	106.1.2.1. Same As 106.1.1.1, 106.1.1.2		
				106.1.3.1. Same As 106.1.1.1, 106.1.1.2		
				106.1.3.2. Availability of methanol injection in the flare header.		
		106.2. Partial leaking of PSV 218A/B	106.2.1. Unexpected flaring	106.2.1.1. Operating and maintenance procedures		
			106.2.2. Loss of production			
			106.2.3. Possible condensate / ...		:Refer To 2	

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Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	106. Misdirected Flow (gas) (cont.)	<p>106.2. Partial leaking of PSV 218A/B (cont.)</p> <p>106.3. Spurious opening of BDV011 on main compression unit discharge header</p> <p>106.4. Spurious opening of ESDV041 in existing downstream facility</p> <p>106.5. Spurious opening of ESDV042 in existing downstream facility</p>	<p>...Hydrates formation vent line downstream PSV218A/B</p> <p>106.3.1. Unexpected flaring</p> <p>106.3.2. Production losses</p> <p>106.3.3. Less Temperature in HP flare header, leading to possible hydrate formation in the flare header .</p> <p>106.4.1. XXX</p> <p>106.5.1. XXX</p>	<p>106.3.1.1. BDV 011 is equipped with limit switch with alarm in DCS</p> <p>106.3.1.2. BDV 011 is equipped air accumulator to allow three strokes in case of instrument air failure.</p> <p>106.3.2.1. Same As-106.3.1.1, 106.3.1.2</p> <p>106.3.3.1. Same As-106.3.1.1, 106.3.1.2</p> <p>106.3.3.2. Availability of methanol injection in the flare header.</p>	:Refer To 2 (cont.)	
No/ Less	107. No/ Less Flow (condensate)	107.1. Spurious closure of ESDV 204	107.1.1. More Level in QA-V-8002B	107.1.1.1. ESDV 204 is equipped with limit switches (with alarm in...		

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Company: KPC
Facility: QASR Compressor station

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Session: (9) 30/07/2013

Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	107. No/ Less Flow (condensate) (cont.)	107.1. Spurious closure of ESDV 204 (cont.) 107.2. Failure close of LV 205 107.3. Manual valves in the condensate outlet line of QA-V- 8002B closed due to misoperation 107.4. Partial blockage of check valve in discharge line of QA-V- 8002B due to mechanical damage .	107.1.1. More Level in QA-V- 8002B (cont.) 107.2.1. Same As-20.1.1 107.3.1. Same As-20.1.1 107.4.1. Same As-20.1.1	...DCS) 107.2.1.1. LV 205 is equipped with limit switches (with alarm in DCS) 107.3.1.1. Operating procedures		
More	108. More Flow (condensate)	108.1. Failure open LV205	108.1.1. Less level in QA-V-8002B	108.1.1.1. LV 205 is equipped with limit switches (with alarm in DCS)		
Reverse	109. Reverse Flow (condensate)	109.1. More pressure QA-V- 8005A (#5B)	109.1.1. Possible back flow of gas from QA-V-8005A to QA-V-8001B	109.1.1.1. Check valve in the QA- V-8001B discharge line		
Misdirected	110. Misdirected Flow (condensate)	110.1. Manual valve in the methanol injection line left open due misoperation	110.1.1. Increase of methanol consumption.	110.1.1.1. Availability of normally close double block and bleed connection.		

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Company: KPC
Facility: QASR Compressor station

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Session: (9) 30/07/2013

Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	111. Higher Temperature	111.1. Refer To 2, 40.3 (More Temperature in #03B)				
Less	112. Lower Temperature	112.1. Refer To 2, 40.3 (Less Temperature in #03B)				
		112.2. Depressurization of main compressor unit discharge header	112.2.1. Less Temperature in main compressor unit discharge header	112.2.1.1. Low temperature alarm on TI033 112.2.1.2. Design temperature on main compressor unit discharge header is equal to minimum temperature due to depressurization		
		112.3. Low ambient temperature.	112.3.1. Possible condensate / hydrates formation in the inlet line of PSV218A/B 112.3.2. Possible wax formation in the condensate discharge line 112.3.3. Possible wax formation in the level instrument connections, leading to operating problems.	112.3.1.1. Inlet line of PSV218A/B is sloped to main suction line in order to drain the condensate. 112.3.2.1. Heat tracing in the condensate line. 112.3.3.1. Availability of heat tracing for level instruments of all condensate drums.	:Refer To 2 :Refer To 5	

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Facility: QASR Compressor station

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Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	113. Higher Pressure	113.1. Refer To 2. ? (More Pressure in #03A) 113.2. External fire	113.2.1. Overpressurization of QA-V-8002B leading to mechanical damage	113.2.1.1. PSV218A/B sized for fire scenario		
Less/ Vacuum	114. Less/ Vacuum Pressure	114.1. Stop of compressor QA-K-8001B	114.1.1. Less Pressure in the main compressor unit discharge header leading to Possible Reverse Flow	114.1.1.1. Check valve downstream QA-V-8002B		

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Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	115. Higher Level	115.1. Spurious closure of ESDV 204	115.1.1. Overfilling of QA-V-8002B leading to liquid carry over to main compressor unit discharge header and to existing export pipeline	115.1.1.1. ESDV 204 is equipped with limit switches with alarm in DCS. 115.1.1.2. LZA 204B High High level Interlock for compressor QA-K-8001A shut down		

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Company: KPC
Facility: QASR Compressor station

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Session: (9) 30/07/2013

Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	115. Higher Level (cont.)	<p>115.1. Spurious closure of ESDV 204 (cont.)</p> <p>115.2. Failure close of LV 205</p> <p>115.3. Manual valves in the condensate outlet line of QA-V-8001A closed due to misoperation</p> <p>115.4. Spurious closure of ESDV017, ESDV018, ESDV019, ESDV020, ESDV021 in the existing facility</p>	<p>115.1.1. Overfilling of QA-V-8002B leading to liquid carry over to main compressor unit discharge header and to existing export pipeline (cont.)</p> <p>115.2.1. Same As-115.1.1</p> <p>115.3.1. Same As-115.1.1</p> <p>115.4.1. Same As-115.1.1.</p>	<p>115.1.1.3. LIC 205 with high level alarm.</p> <p>115.2.1.1. LV 205 is equipped with limit switches (with alarm in DCS)</p> <p>115.2.1.2. Same As-115.1.1.2</p> <p>115.3.1.1. Operating procedures.</p> <p>115.3.1.2. Same As-115.1.1.2</p> <p>115.4.1.1. ESDV017, ESDV018, ESDV019, ESDV020, ESDV021 equipped with limit switches with alarm in DCS.</p>		
No/ Less	116. No/ Less Level	116.1. Failure open of LV 205	116.1.1. Gas blow by to the condensate suction drum QA-V-8005A (#05B)	116.1.1.1. LZA 204A low low level Interlock to close the shutdown valve ESDV 204 on liquid discharge line.		

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Company: KPC
Facility: QASR Compressor station

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Session: (9) 30/07/2013

Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	117. Different Composition 118. Deposition	117.1. Different composition from existing facility 117.2. Refer To 112.1, 112.2, 41.4 (Less Temperature)	117.1.1. No significant consequences in this node			

Session: (9) 30/07/2013

Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	119. Others Maintenance	119.1. Periodic maintenance of compressor train QA-K-8001B	119.1.1. Need to isolate, drain, vent, purge the compressor train QA-K-8001B	119.1.1.1. Availability of fixed devices for isolation venting & draining. High point vent and low point drains to be provided for line 119.1.1.2. Provision for utility station for nitrogen purging.		

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Company: KPC
Facility: QASR Compressor station

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Session: (9) 30/07/2013

Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	120. Other	120.1. Incorrect opening of ESDV 202 A during start up.	120.1.1. Possible hammering in down stream piping leading to potential mechanical damage .	120.1.1.1. PDZA 202 to inhibit the opening of main line valve (ESDV202A) if the differential pressure exceeds 2 bar.		

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Node: (4B) Compressor "B" discharge separator: Compressor Discharge Drum Train B QA-V-8002 B (OT: 58°C; OP:123 barg) when working downstream Train "A"

Intention: Condensate separation in compressor discharge

Drawings: 3538-200-KKD-12210

3538-200-KKD-12214

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	121. Failure Utility	121.1. Loss of electrical power	121.1.1. Possible loss of process control	121.1.1.1. UPS provided as backup for all control system .		
		121.2. Loss of instrument air	121.2.1. Spurious closure of ESDV 202A, ESDV032A, ESDV033A	121.2.1.1. ESDV 202A, ESDV032A, ESDV033A equipped with limit switches with alarm in DCS		
			121.2.2. Spurious closure of ESDV017, ESDV018, ESDV019, ESDV020, ESDV021 in the existing facility	121.2.2.1. ESDV017, ESDV018, ESDV019, ESDV020, ESDV021 equipped with limit switches with alarm in DCS.		

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Company: KPC
Facility: QASR Compressor station

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Session: (2) 18/07/2013

Node: (5A) Condensate tie-in from existing unit (OT: 57.4 °C; OP: 65 :7 barg),

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
NNo/ Less	122. No/ Less Flow	122.1. No flow from tie-in 011 (NC)	122.1.1. High level in the separators of the existing facility 122.1.2. Loss of production 122.1.3. Low level in the QA-V-8005A	122.1.1.1. Existing facility provided with proper safeguards for High Level deviation		
		122.2. No flow from tie-in 013 (NO)	122.2.1. Same As 83.1.1, 83.1.2, 83.1.3	122.2.1.1. Existing facility provided with proper safeguards for High Level deviation		
		122.3. Spurious closure of ESDV-034A	122.3.1. Same As 83.1.1, 83.1.2, 83.1.3	122.3.1.1. ESDV-034A is equipped with limit switches with alarm in DCS		
		122.4. Spurious closure of ESDV-035A	122.4.1. Same As 83.1.1, 83.1.2, 83.1.3	122.4.1.1. ESDV-035A is equipped with limit switches with alarm in DCS		
		122.5. Spurious closure of ESDV-011A	122.5.1. Same As 83.1.1, 83.1.2, 83.1.3	122.5.1.1. ESDV-011A is equipped with limit switches with alarm in DCS		
More	123. More Flow	123.1. More flow from existing facility	123.1.1. More level in QA-V-8005A	123.1.1.1. The new unit is designed for the maximum flow rate from existing facility		
Reverse	124. Reverse Flow	124.1. Manual valve in TI 011 left open due to misoperation while using TI 013	124.1.1. Possible condensate back flow from TI 013 to TI 011 leading to no significant consequences			

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (2) 18/07/2013

Node: (5A) Condensate tie-in from existing unit (OT: 57.4 °C; OP: 65 :7 barg), Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected	125. Misdirected Flow	125.1. PSV-006A/B leakage	125.1.1. Unexpected flaring	125.1.1.1. Operating and maintenance procedure. 125.1.1.2. Ultra-sonic flow meter FT-048 on flare header.		
		125.2. PSV-013 leakage	125.2.1. Unexpected flaring	125.2.1.1. Operating and maintenance procedure		
		125.3. Manual Valves on Inlet Line of QA-V-8005B Left Open due to misoperation.	125.3.1. Increase of level in QA-V-8005B leading to hazardous condition in the drum.	125.3.1.1. Manual valves inlet / outlet lines of QA-V-8005A/B are mechanically interlocked. 125.3.1.2. Operating procedures.		

Session: (3) 21/07/2013

Node: (5A) Condensate tie-in from existing unit (OT: 57.4 °C; OP: 65 :7 barg), Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	126. Higher Temperature	126.1. More Temperature from existing facility	126.1.1. Increase of condensate flash along the line. 126.1.2. More pressure in QA-V-8005A (#05B).	126.1.1.1. Design temperature of Suction Manifold is consistent with Upstream existing facility. 126.1.1.2. The suction manifold is provided with pipe support sized for two phase flow.		

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Facility: QASR Compressor station

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Session: (3) 21/07/2013

Node: (5A) Condensate tie-in from existing unit (OT: 57.4 °C; OP: 65 :7 barg),

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less	127. Lower Temperature	127.1. Less Temperature from existing facility 127.2. Low ambient temperature.	127.1.1. Possible wax formation in the line. 127.2.1. Possible condensate / hydrates formation in the inlet line of PSV006/B, PSV013	127.1.1.1. The suction manifold is provided with heat tracing. 127.2.1.1. Inlet line of PSV006A/B, PSV013 sloped to main suction line in order to drain the condensate. 127.2.1.2. Inlet line of PSV006A/B, PSV013 is provided with heat tracing.	:Refer To 2	

Session: (3) 21/07/2013

Node: (5A) Condensate tie-in from existing unit (OT: 57.4 °C; OP: 65 :7 barg),

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	128. Higher Pressure	128.1. Pressure More from existing facility (control valve failure) 128.2. Thermal expansion due to line isolation	128.1.1. Overpressurization of the condensate header to QA-V-8005A 128.2.1. Same As-128.1.1	128.1.1.1. PSV-006A/B sized for control valve failure scenario. 128.1.1.2. High pressure alarm on PI-923 128.1.1.3. PZA-924 high high pressure interlock to close ESDV-034A and ESDV 035A at tie in with existing facility. 128.2.1.1. PSV-013 sized for line thermal expansion		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (3) 21/07/2013

Node: (5A) Condensate tie-in from existing unit (OT: 57.4 °C; OP: 65 :7 barg),

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less/ Vacuum	129. Less/ Vacuum Pressure	129.1. No causes identified				

Session: (3) 21/07/2013

Node: (5A) Condensate tie-in from existing unit (OT: 57.4 °C; OP: 65 :7 barg),

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	130. Higher Level	130.1. Not Applicable				
No/ Less	131. No/ Less Level	131.1. Not Applicable				

Session: (3) 21/07/2013

Node: (5A) Condensate tie-in from existing unit (OT: 57.4 °C; OP: 65 :7 barg),

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	132. Different Composition	132.1. Different composition from existing facility	132.1.1. No significant consequences in this node			
		132.2. Refer To 127.1 (Less Temperature from existing facility)	132.1.2. Composition Different in QA-V-8005A (#05B).			
	133. Deposition	133.1. Refer To 132.2				

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Facility: QASR Compressor station

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Session: (3) 21/07/2013

Node: (5A) Condensate tie-in from existing unit (OT: 57.4 °C; OP: 65 :7 barg), Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	134. Others Maintenance	134.1. Periodic maintenance	134.1.1. Need for isolation venting , draining and purging of condensate header to QA-V-8005A	134.1.1.1. Availability of fixed devices for isolation venting & draining . High point vent and low point drains to be provided for line . 134.1.1.2. Provision for utility station for nitrogen purging. 134.1.1.3. The suction header is provided by a heat tracing to be used during draining operation.		
		134.2. Corrosion issues	134.2.1. No significant consequence, due to selected material for piping.			

Session: (3) 21/07/2013

Node: (5A) Condensate tie-in from existing unit (OT: 57.4 °C; OP: 65 :7 barg), Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12215

3538-200-KKD-12250

3538-200-KKD-12353

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	135. Other	135.1. No causes identified				

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Facility: QASR Compressor station

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Node: (5A) Condensate tie-in from existing unit (OT: 57.4 °C; OP: 65 :7 barg), Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12215
3538-200-KKD-12250
3538-200-KKD-12353

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	136. Failure Utility	136.1. Loss of electrical power 136.2. Loss of instrument air	136.1.1. Possible loss of process control 136.2.1. Spurious closure of ESDV 034 A, ESDV035A leading to no flow in this line.	136.1.1.1. UPS provided as backup for all control system . 136.2.1.1. ESDV 034A/035A equipped with limit switch (with alarm in DCS)		

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Company: KPC
Facility: QASR Compressor station

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	137. No/ Less Flow (condensate)	<p>137.1. Spurious closure of ESDV-001A</p> <p>137.2. Pump QA-P-8003A/B/C failure</p> <p>137.3. Spurious closure of ESDV-014</p>	<p>137.1.1. More level in QA-V-8005A</p> <p>137.1.2. Pump QA-P-8003A/B/C cavitation leading to possible mechanical damage</p> <p>137.2.1. Same As-137.1.1</p> <p>137.3.1. Same As-137.1.1</p> <p>137.3.2. Increase of pressure up to pump shut-off leading to piping mechanical damage</p>	<p>137.1.2.1. Condensate export pump can start only if ESDV-001A/B is fully open</p> <p>137.1.2.2. Low low flow interlock FZA-019A/B/C to stop the pump QA-P-8003A/B/C</p> <p>137.2.1.1. FZA-011A low low flow activate the stand-by pump</p> <p>137.2.1.2. Same As-137.1.2.2</p> <p>137.3.1.1. ESDV-014 is equipped with limit switches with alarm in DCS</p> <p>137.3.1.2. Same As-137.1.2.2</p> <p>137.3.2.1. High pressure alarm in PI-012A /B/C on pump discharge line</p> <p>137.3.2.2. High high pressure interlock PZA-918A/B/C on pump discharge line to stop the pump QA-P-8003A/B/C</p>		

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Company: KPC
Facility: QASR Compressor station

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	137. No/ Less Flow (condensate) (cont.)	<p>137.3. Spurious closure of ESDV-014 (cont.)</p> <p>137.4. Failure of LIC-001A stopping pump QA-P-8003A/B/C</p> <p>137.5. blockage of pump QA-P-8003A/B/C suction strainer</p> <p>137.6. Spurious closure of XV-027A/B/C in pump discharge line</p> <p>137.7. Spurious closure of ESDV-036A/037A in tie in point with existing facility.</p>	<p>137.3.2. Increase of pressure up to pump shut-off leading to piping mechanical damage (cont.)</p> <p>137.4.1. Same As-137.1.1</p> <p>137.5.1. Pump QA-P-8003A/B/C cavitation leading to possible mechanical damage</p> <p>137.6.1. Same As-137.1.1, 137.3.2</p> <p>137.7.1. Same As-137.1.1, 137.3.2</p>	<p>137.3.2.3. Availability of minimum flow line for each pump regulated by FIC-001A/B/C</p> <p>137.3.2.4. PSV-093A/B/C designed for blocked outlet case</p> <p>137.3.2.5. Low low flow interlock FZA-019A/B/C to stop the pump QA-P-8003A/B/C</p> <p>137.5.1.1. High alarm in PDI-009A/B/C</p>	<p>25. Check the possibility of adding the time delay for closure of XV-027A/B/C after pump stop.</p>	ENPPI
More	138. More Flow (condensate)	138.1. Failure of LIC-001A setting at maximum speed of...	138.1.1. Less level in QA-V-8005A			

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Facility: QASR Compressor station

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	138. More Flow (condensate) (cont.)	...pump QA-P-8003A/B/C	138.1.1. Less level in QA-V-8005A (cont.)			
Reverse	139. Reverse Flow (condensate)	139.1. Failure of the pump QA-P-8003A/B/C	139.1.1. Possible back flow of high pressure gas to QA-V-8005A leading to increase of pressure in QA-V-8005A	139.1.1.1. Check valves on pump discharge (one upstream and one downstream minimum flow line) 139.1.1.2. Existing check valve on condensate header 139.1.1.3. in case of pump stop QA-P-8003A/B/C the relevant XV027A/B/C on the discharge line will be closed by DCS		
Misdirected	140. Misdirected Flow (condensate)	140.1. PSV-093A/B/C leakage	140.1.1. No significant impact since the vent line of PSV-093A/B/C is routed back to QA-V-8005A			
	141. Misdirected Flow (gas)	141.1. Spurious opening of BDV001A	141.1.1. Unexpected flaring 141.1.2. Pressure Less in QA-V-8005A	141.1.1.1. BDV 001A is equipped with limit switch with alarm in DCS 141.1.1.2. BDV 001A is equipped air accumulator to allow three strokes in case of instrument air failure.		

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	141. Misdirected Flow (gas) (cont.)	141.2. Spurious opening of PSV007A/B	141.2.1. Unexpected flaring 141.2.2. Pressure Less in QA-V-8005A	141.2.1.1. Operating and maintenance procedures		
No/ Less	142. No/ Less Flow (water)	142.1. Spurious closure of ESDV-026A 142.2. Failure close of LV-016A 142.3. Existing manual valve on tie-in 038 closed due to misoperation	142.1.1. More level interface in QA-V-8005A 142.2.1. Same As 142.1.1 142.3.1. Same As 142.1.1	142.1.1.1. ESDV-026 is equipped with limit switches with alarm in DCS		
More	143. More Flow (water)	143.1. Failure open of LV-016A	143.1.1. Low level in QA-V8005A			
Reverse	144. Reverse Flow (water)	144.1. No causes identified				
Misdirected	145. Misdirected Flow (water)	145.1. No causes identified				

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	146. Higher Temperature	146.1. More Temperature from existing facility	146.1.1. Increase of vaporization leading to More Pressure in QA-V-8005A	146.1.1.1. High temperature alarm on TI-001A 146.1.1.2. Design temperature of QA-V-8005A is consistent with design temperature of upstream existing facility.		
		146.2. Solar radiation during summer.	146.2.1. No significant consequences.	146.2.1.1. Design temperature QA-V-8005A is equal to 110 C.		
Less	147. Lower Temperature	147.1. Less Temperature from existing facility	147.1.1. Possible wax formation in QA-V-8005A and suction line.	147.1.1.1. Low temperature alarm on TI-001A 147.1.1.2. Heat tracing in the condensate line.		
		147.2. Less Pressure in QA-V-8005A	147.2.1. Reduction of temperature in QA-V-8005A	147.2.1.1. Design Temperature of QA-V-8005A is suitable for minimum temperature reachable in the drum in case of depressurization. 147.2.1.2. Same As 147.1.1.1		
		147.3. Low ambient temperature.	147.3.1. Possible condensate / hydrates formation in the inlet line of PSV007/B 147.3.2. Possible wax formation in the condensate suction line to ...	147.3.1.1. Inlet line of PSV007A/B sloped to main suction line in order to drain the condensate. 147.3.2.1. Heat tracing in the condensate line.	:Refer To 2	

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less (cont.)	147. Lower Temperature (cont.)	147.3. Low ambient temperature. (cont.)	<p>...QA-P-8003A/B/C line</p> <p>147.3.3. Possible wax formation in the level instrument connections, leading to operating problems.</p> <p>147.3.4. Possible wax formation in standby tank QA-V-8005B.</p>	<p>147.3.2.1. Heat tracing in the condensate line. (cont.)</p> <p>147.3.3.1. Availability of heat tracing for level instruments of QA-V-8005A & all condensate drums.</p> <p>147.3.4.1. Low temperature alarm on TI-001B</p>	<p>:Refer To 5</p> <p>26. Insure that the operating manual of the plant shall include the need for emptying of standby condensate drum to prevent possible wax formation.</p>	ENPPI

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	148. Higher Pressure	148.1. Failure close of PV003A	148.1.1. Increase of pressure in QA-V-8005A leading to no significant consequences	148.1.1.1. The design pressure of QA-V-8005A is suitable for maximum pressure reachable from the condensate line.		

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	148. Higher Pressure (cont.)	<p>148.2. No Flow of gas to compressor QA-K-8003A (#06F)</p> <p>148.3. Failure of PDIC increasing pressure in QA-V-8005A</p> <p>148.4. More Level in QA-V-8005A</p> <p>148.5. External Fire</p> <p>148.6. Thermal expansion of isolated discharge manifold.</p>	<p>148.2.1. Same As-148.1.1</p> <p>148.3.1. Same As-148.1.1</p> <p>148.4.1. Overfilling leading to overpressurization of QA-V-8005A</p> <p>148.5.1. Overpressurization of QA-V-8005A</p> <p>148.6.1. Overpressurization of discharge manifold.</p>	<p>148.2.1.1. Control loop PIC003 to divert gas to flare</p> <p>148.2.1.2. High pressure alarm on PI-002A.</p> <p>148.2.1.3. PZA002A high high pressure interlock to close the ESDV011A in condensate inlet line.</p> <p>148.4.1.1. PZA002A high high pressure interlock to close the ESDV011A in condensate inlet line.</p> <p>148.4.1.2. PSV007A/B size for fire scenario</p> <p>148.5.1.1. PSV007A/B size for fire scenario</p> <p>148.5.1.2. Availability of BDV001A to depressurize QA-V-8005A</p> <p>148.6.1.1. PSV014 size for thermal expansion.</p>		

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	148. Higher Pressure (cont.)	148.7. Refer To 29.1 (Gas blow by to the condensate suction drum QA-V-8005A)	148.7.1. Increase of pressure in QA-V-8005A leading to no significant consequences	148.7.1.1. Design pressure of QA-V-8005A is suitable for maximum pressure due to gas blow by	27. Check adding limit switch (open position) for PV-003A.	ENPPI
Less/ Vacuum	149. Less/ Vacuum Pressure (QA-V-8005A)	149.1. Failure open of PV003A	149.1.1. Unexpected flaring			
			149.1.2. Loss of production			
			149.1.3. Temperature Less in QA-V-8005A			
			149.1.4. Possible pump QA-V-8003A/B/C cavitation while plant operating at low pressure.			
		149.2. Running pump QA-P-8003A/B/C with condensate inlet line closed.	149.2.1. Vacuum condition in QA-V-8005A.	149.2.1.1. QA-V-8005A is sized for F.V.		
			149.2.2. No flow of condensate in pump suction line.	149.2.2.1. Refer to no flow.		
		149.3. Running compressor QA-K-8003 with condensate inlet line closed.	149.3.1. Vacuum condition in QA-V-8005A.	149.3.1.1. QA-V-8005A is sized for F.V.		
			149.3.2. No flow of gas in flash gas compressor suction line (#6F).			

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	150. Higher Level (condensate)	150.1. Refer To 137.1, 137.2, 137.3, 137.4 (No Flow of condensate)	150.1.1. Overfilling of QA-V-8005A leading to condensate carry-over to Fuel gas circuit (#13) and More Pressure in QA-V-8005A 150.1.2. Overfilling of QA-V-8005A leading to condensate carry-over to compressor QA-K-8003A with possible mechanical damage	150.1.1.1. LZA-002A high high level interlock to close ESDV011A in inlet line of QA-V-8005A 150.1.1.2. PSV-007A/B sized for over filling scenario. 150.1.1.3. Indication of status of QA-P-8003A/B/C in DCS 150.1.1.4. High Level alarm in LIC-001A 150.1.2.1. Same As 150.1.1.1, 150.1.1.2, 150.1.1.3, 150.1.1.4		
No/ Less	151. No/ Less Level (condensate)	151.1. Failure of LIC-001A setting at maximum speed of pump QA-P-8003A/B/C	151.1.1. Pump QA-P-8003A/B/C dry running leading to cavitation and possible mechanical damage (#06F).	151.1.1.1. LZA-002A low low level interlock to close ESDV001A in condensate discharge line and stop QA-P-8003A/B/C		
	152. Higher Level (interface)	152.1. Failure close of LV-016A	152.1.1. Possible water carry over to condensate header leading to Different Composition in the export line	152.1.1.1. LZA021B high high level alarm 152.1.1.2. Corrosion inhibitor injection in export line.		
	153. No/ Less Level...	153.1. Failure open of LV-016A	153.1.1. Possible condensate...	153.1.1.1. LZA-021A low low...	28. Check possibility...	ENPPI

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	...(interface)	153.1. Failure open of LV-016A (cont.)	...carry over to the degasser leading to Pressure More in the Degasser and More Flow of gas to cold vent (existing facility)	...level interlock to close ESDV026A in water discharge line 153.1.1.2. PZA-076 (2oo3 redundant logic) high high pressure interlock, in degasser QA-V-4005 inlet line, to close ESDV026A in water discharge line. 153.1.1.3. The vent line of degasser is equipped with flame arrestor	...to configure LV-016A/B as tight shut off.	

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	154. Different Composition	154.1. Different composition from existing unit 154.2. Refer To 147.3 (Low ambient temperature)	154.1.1. Possible increase of water content.	154.1.1.1. Existing facility is provided with water separator.		
	155. Deposition	155.1. Refer To 147.3 (Low...				

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different (cont.)	155. Deposition (cont.)	...ambient temperature)				

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	156. Others Maintenance	156.1. Failure of a pump QA-P-8003A/B/C 156.2. Periodic maintenance of QA-V-8005A	156.1.1. Need for isolation, draining and purging the pump section 156.2.1. Need for isolation, draining and purging QA-V-8005A	156.1.1.1. Availability of fixed devices for isolation venting & draining . High point vent and low point drains to be provided for line . 156.1.1.2. Provision for utility station for nitrogen purging. 156.2.1.1. Availability of fixed devices for isolation venting & draining . High point vent and low point drains to be provided for line . 156.2.1.2. Provision for utility station for nitrogen purging.		

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others (cont.)	156. Others Maintenance (cont.)	156.3. Corrosion issues	156.3.1. No significant consequence due to selected material for drum and piping.			

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	157. Other	157.1. No causes identified				

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	158. Failure Utility	158.1. Loss of electrical power	158.1.1. Possible loss of process control	158.1.1.1. UPS provided as backup for all control system .		
		158.2. Stop of the pump QA-P-...	158.2.1. Refer To 137.2.1...			

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Node: (5B) Condensate system including Condensate Suction Drum QA-V-8005 A (OT: 57.4 °C; OP: 65 -7 barg), Condensate Export Pumps QA-P-8003 A/B/C (discharge OP: 123 barg)

Intention: Condensate storage and distribution

Drawings: 3538-200-KKD-12250

3538-200-KKD-12251

3538-200-KKD-12353

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure (cont.)	158. Failure Utility (cont.)	...8003A/B/C 158.3. Loss of instrument air	...(Pump QA-P-8003A/B/C failure) 158.3.1. Spurious closure of ESDV 001A, 026A, 014 158.3.2. Spurious closure of XV027A/B/C	158.3.1.1. ESDV 001A, 026A, 014 equipped with limit switch (with alarm in DCS) 158.3.2.1. XV027A/B/C equipped with limit switch (with alarm in DCS)		

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Node: (6F) Flash Gas Compressor QA-K-8003 A (OT: 57-68°C; suction/ discharge OP: 31.9 - 35.9 barg)

Intention: Flash gas recompression

Drawings: 3538-200-KKD-12210

3538-200-KKD-12250

3538-200-KKD-12361

3538-200-KKD-12362

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	159. No/ Less Flow	159.1. Spurious closure of ESDV013	159.1.1. Compressor QA-K-8003A surge	159.1.1.1. ESDV-013 equipped with limit switches with alarm in DCS 159.1.1.2. Low flow alarm on FI003A 159.1.1.3. Low pressure alarm on PI070A 159.1.1.4. PZA071A low low pressure interlock to stop the compressor QA-K-8003A	29. Verify flash gas compressor suction pipe (#80029) & (#80018) is designed for full vacuum.	ENPPI
		159.2. Manual valve on QA-K-8003A suction line left closed due to misoperation	159.2.1. Same As 159.1.1, 159.1.2			
		159.3. Blockage of strainer in the suction of compressor QA-8003A	159.3.1. Same As 159.1.1, 159.1.2		30. Check with the flash gas compressor vendor the need for permanent strainer in the suction line.	KPC
		159.4. Manual valve on QA-K-...	159.4.1. Pressure More in...	159.4.1.1. PZA021A high high...		

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Facility: QASR Compressor station

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Node: (6F) Flash Gas Compressor QA-K-8003 A (OT: 57-68°C; suction/ discharge OP: 31.9 - 35.9 barg)

Intention: Flash gas recompression

Drawings: 3538-200-KKD-12210

3538-200-KKD-12250

3538-200-KKD-12361

3538-200-KKD-12362

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	159. No/ Less Flow (cont.)	...8003A discharge line left closed due to misoperation	...compressor QA-K-8003A discharge line	...pressure interlock to stop the compressor QA-K-8003A		
		159.5. Spurious closure of ESDV013A/B in discharge line of QA-K-8003A/B	159.5.1. Same As 159.4.1	159.4.1.2. PSV-022A sized for blocked discharge. 159.5.1.1. ESDV-013A/B equipped with limit switches with alarm in DCS 159.5.1.2. Same As 159.4.1.1		
		159.6. Partial blockage of check valve downstream QA-K-8003A .	159.6.1. Same As 159.4.1	159.6.1.1. Non-slam type check valve.		
		159.7. Failure of compressor QA-K-8003A.	159.7.1. Pressure More in QA-V-8005A (#5B).			
		159.8. Failure of PDIC917 stopping compressor QA-K-8003A.	159.8.1. Same As 159.7.1			
More	160. More Flow	160.1. Failure of PDIC917 putting to maximum speed compressor QA-K-8003A.	160.1.1. No significant consequence.			
Reverse	161. Reverse Flow	161.1. Stop of compressor QA-K-8003A.	161.1.1. Back flow of process gas from QA-K-8001A suction to QA-K-8003A leading to Pressure More.	161.1.1.1. Double check valve (dissimilar) on discharge of QA-K-8003A/B. 161.1.1.2. High pressure alarm...		

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Company: KPC
Facility: QASR Compressor station

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Session: (3) 21/07/2013

Node: (6F) Flash Gas Compressor QA-K-8003 A (OT: 57-68°C: suction/ discharge OP: 31.9 - 35.9 barg)

Intention: Flash gas recompression

Drawings: 3538-200-KKD-12210

3538-200-KKD-12250

3538-200-KKD-12361

3538-200-KKD-12362

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Reverse (cont.)	161. Reverse Flow (cont.)	161.1. Stop of compressor QA-K-8003A. (cont.)	161.1.1. Back flow of process gas from QA-K-8001A suction to QA-K-8003A leading to Pressure More. (cont.)	...on PI-072 161.1.1.3. PZA-062 high high pressure interlock to close ESDV-013A/B. 161.1.1.4. PSV026A on discharge line of QA-K-8003A/B sized for reverse flow scenario.		
Misdirected	162. Misdirected Flow	162.1. PSV-022A leakage. 162.2. PSV-026A leakage. 162.3. Spurious opening of BDV-008.	162.1.1. Unexpected flaring. 162.1.2. Loss of production. 162.2.1. Unexpected flaring. 162.2.2. Loss of production. 162.3.1. Unexpected flaring. 162.3.2. Loss of production.	162.3.1.1. BDV 008 is equipped with limit switch with alarm in DCS. 162.3.1.2. BDV 008 is equipped air accumulator to allow three strokes in case of instrument air failure.		

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Company: KPC
Facility: QASR Compressor station

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Session: (3) 21/07/2013

Node: (6F) Flash Gas Compressor QA-K-8003 A (OT: 57-68°C; suction/ discharge OP: 31.9 - 35.9 barg)

Intention: Flash gas recompression

Drawings: 3538-200-KKD-12210

3538-200-KKD-12250

3538-200-KKD-12361

3538-200-KKD-12362

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	163. Higher Temperature	163.1. Flow Less in suction of compressor	163.1.1. Increase of compressor rate leading to overheating of discharge line	163.1.1.1. High temperature alarm on TI003A 163.1.1.2. TZA004A high high temperature interlock to stop compressor QA-K-8003A		
Less	164. Lower Temperature	164.1. Depressurization of flash gas compressor circuit.	164.1.1. Decrease of temperature leading to no significant consequence.	164.1.1.1. Design temperature of flash gas compressor circuit is consistent with minimum temperature during depressurization.		

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Node: (6F) Flash Gas Compressor QA-K-8003 A (OT: 57-68°C; suction/ discharge OP: 31.9 - 35.9 barg)

Intention: Flash gas recompression

Drawings: 3538-200-KKD-12210

3538-200-KKD-12250

3538-200-KKD-12361

3538-200-KKD-12362

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	165. Higher Pressure	165.1. Refer To 159.4 (Manual valve on QA-K-8003A discharge line left closed due to misoperation)				
Less/ Vacuum	166. Less/ Vacuum Pressure	166.1. Refer To 159.1 (Spurious closure of ESDV013).				

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Node: (6F) Flash Gas Compressor QA-K-8003 A (OT: 57-68°C; suction/ discharge OP: 31.9 - 35.9 barg)
Intention: Flash gas recompression
Drawings: 3538-200-KKD-12210
3538-200-KKD-12250
3538-200-KKD-12361
3538-200-KKD-12362

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	167. Higher Level	167.1. Not applicable				
No/ Less	168. No/ Less Level	168.1. Not applicable				

Session: (3) 21/07/2013
Node: (6F) Flash Gas Compressor QA-K-8003 A (OT: 57-68°C; suction/ discharge OP: 31.9 - 35.9 barg)
Intention: Flash gas recompression
Drawings: 3538-200-KKD-12210
3538-200-KKD-12250
3538-200-KKD-12361
3538-200-KKD-12362

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	169. Different Composition	169.1. Level More in QA-V-8005A (#05B)	169.1.1. Overfilling of QA-V-8005A leading to condensate carry-over to compressor QA-K-8003A with possible mechanical damage	169.1.1.1. LZA-002AB high high level interlock to close ESDV011A in inlet line of QA-V-8005A (#05B)	31. Check with flash gas compressor vendor the possibility to install suction drum for liquid separation.	KPC
	170. Deposition	170.1. No causes identified.				

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Facility: QASR Compressor station

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Session: (3) 21/07/2013
Node: (6F) Flash Gas Compressor QA-K-8003 A (OT: 57-68°C; suction/ discharge OP: 31.9 - 35.9 barg)
Intention: Flash gas recompression
Drawings: 3538-200-KKD-12210
3538-200-KKD-12250
3538-200-KKD-12361
3538-200-KKD-12362
Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	171. Others Maintenance	171.1. Failure of compressore QA-K-8003A 171.2. Corrosion issues	171.1.1. Need for isolation, draining and purging the pump section 171.2.1. No significant consequences due to proper material selection.	171.1.1.1. Availability of fixed devices for isolation venting & draining . High point vent and low point drains to be provided for line . 171.1.1.2. Provision for utility station for nitrogen purging.		

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Node: (6F) Flash Gas Compressor QA-K-8003 A (OT: 57-68°C; suction/ discharge OP: 31.9 - 35.9 barg)
Intention: Flash gas recompression
Drawings: 3538-200-KKD-12210
3538-200-KKD-12250
3538-200-KKD-12361
3538-200-KKD-12362
Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	172. Other	172.1. No causes identified				

Worksheet

Company: KPC
Facility: QASR Compressor station

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Node: (6F) Flash Gas Compressor QA-K-8003 A (OT: 57-68°C; suction/ discharge OP: 31.9 - 35.9 barg)

Intention: Flash gas recompression

Drawings: 3538-200-KKD-12210

3538-200-KKD-12250

3538-200-KKD-12361

3538-200-KKD-12362

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	173. Failure Utility	<p>173.1. Loss of electrical power</p> <p>173.2. Loss of instrument air</p> <p>173.3. Loss of nitrogen.</p>	<p>173.1.1. Possible loss of process control</p> <p>173.1.2. Refer To 159.7.1 (Failure of compressor QA-K-8003A)</p> <p>173.2.1. Spurious closure of ESDV 013, 13A/B</p> <p>173.3.1. Inefficient flash compressor gas sealing.</p>	<p>173.1.1.1. UPS provided as backup for all control system .</p> <p>173.2.1.1. ESDV 013, 13A/B equipped with limit switch (with alarm in DCS)</p>	<p>32. Check with the vendor the need of nitrogen for sealling purposes.</p>	KPC

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Company: KPC
Facility: QASR Compressor station

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Session: (4) 22/07/2013

Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	174. No/ Less Flow	<p>174.1. Failure of air compressor QA-K-8002A/B/C</p> <p>174.2. Plugging of air intake of compressor QA-K-8002A/B/C</p> <p>174.3. Partial blockage of check valve downstream QA-K-8002A/B/C</p> <p>174.4. Failure of PIC073 with shut down of QA-K-8002A/B/C</p>	<p>174.1.1. Less Pressure in QA-V-8009</p> <p>174.2.1. Same As 174.1.1</p> <p>174.2.2. Possible surge of QA-K-8002A/B/C leading to mechanical damage.</p> <p>174.3.1. Same As 174.1.1</p> <p>174.4.1. Same As 174.1.1</p>	<p>174.1.1.1. Indication of compressor QA-K-8002 status at DCS</p> <p>174.1.1.2. Availability of spare compressor, automatically started up by low pressure on PIC-073.</p> <p>174.1.1.3. Availability of connection for portable air compressor.</p> <p>174.2.1.1. Design of air intake and relevant filter shall take into consideration the presence of sand.</p> <p>174.2.1.2. The QA-K-8002A/B/C is designed for outdoor service.</p>		
More	175. More Flow	175.1. Start up of spare compressor due to PIC-073...	175.1.1. More Pressure in QA-V-8009.			

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Company: KPC
Facility: QASR Compressor station

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Session: (4) 22/07/2013

Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	175. More Flow (cont.)	...control error.	175.1.1. More Pressure in QA-V-8009. (cont.)			
		175.2. Increase of the air consumption from utility station	175.2.1. Less Pressure in the instrument air distribution network	175.2.1.1. The design flow rate for air to utility station air is minor compared to the flow rate guaranteed by QA-K-8002A/B/C		
Reverse	176. Reverse Flow	176.1. Failure of air compressor QA-K-8002A/B/C	176.1.1. Possible back flow of compressed air to air intake leading to Less Pressure in QA-V-8009.	176.1.1.1. Check valve on discharge line of compressor QA-K-8002A/B/C		
			176.1.2. No flow to QA-A-8005A/B (#08).			
Misdirected	177. Misdirected Flow	177.1. Manual valve on by-pass line of QA-V-8009 left open due to misoperation	177.1.1. Air containing free water is sent to the plant air distribution network (#09) and to Air Drier package (#08)	177.1.1.1. Air Drier Package is provided with coalescer filter upstream drying beds.		
		177.2. Failure of automatic draining device on QA-V-8009.	177.2.1. Release of air in the atmosphere leading to Less Pressure in QA-V-8009			
		177.3. PSV076A/B leakage	177.3.1. Flow Misdirected of compressed air to atmosphere leading to Pressure Less in QA-V-8009			

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Company: KPC
Facility: QASR Compressor station

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Session: (4) 22/07/2013

Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	178. Higher Temperature	178.1. Temperature More from QA-K-8002A due to failure of cooling system. 178.2. High ambient temperature.	178.1.1. Temperature More in QA-V-8009 leading to possible mechanical stress. 178.2.1. Temperature More in QA-V-8009 leading to possible mechanical stress.	178.1.1.1. High temperature alarm on TI-025 178.1.1.2. High high temperature interlock is provided in the discharge line of each single compressor QA-K-8002A/B/C to stop the compressor when temperature reaches a value close to 70 C. 178.2.1.1. Design temperature for air compressor intake is 50 C. 178.2.1.2. The compressor QAK-8002A/B/C is installed inside the building provided with forced ventilation.		
Less	179. Lower Temperature	179.1. Low ambient temperature	179.1.1. No significant consequences			

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Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	180. Higher Pressure	180.1. Failure of PIC073 setting the compressor QA-K-8002A/B/C to maximum speed	180.1.1. More Pressure in QA-V-8009 leading to no significant consequences	180.1.1.1. Design Pressure of QA-V-8009 is aligned with design temperature of QA-K-8002A/B/C		

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Company: KPC
Facility: QASR Compressor station

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Session: (4) 22/07/2013

Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	180. Higher Pressure (cont.)	180.2. External fire	180.2.1. Overpressurization of QA-V-8009	180.2.1.1. PSV 076A/B size for fire scenario		
Less/ Vacuum	181. Less/ Vacuum Pressure	181.1. Failure of PIC073 stopping the compressor QA-K-8002A/B/C	181.1.1. Pressure Less in air distribution network (#08) leading to plant shut down	181.1.1.1. PZA-075A low low 1 pressure interlock to close ESDV-038 on header to existing facility. 181.1.1.2. PZA-075B low low 2 pressure interlock to close ESDV-015 on Utility Station. 181.1.1.3. PZA-075C low low 3 pressure interlock to close ESDV-016 on header to nitrogen generation.	33. Provide pressure transmitter with low pressure alarm in air line to utility station, downstream ESDV-015.	ENPPI
		181.2. Refer to 177.4 (Failure of PIC073 with shut down of QA-K-8002A/B/C)	181.2.1. Same As 181.1.1			
		181.3. Refer To 177.2 (Manual valve on QA-V-8009 water draining line left open due to misoperation)	181.3.1. Same As 181.1.1			
		181.4. Refer To 177.3 (PSV076A/B leakage)	181.4.1. Same As 181.1.1			
		181.5. More flow to utility station (manual valve on utility station left open due to misoperation).	181.5.1. Same As 181.1.1			

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Company: KPC
Facility: QASR Compressor station

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Session: (4) 22/07/2013

Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	182. Higher Level	182.1. Failure of automatic draining device of QA-V-8009 in closed position. 182.2. Failure of automatic draining device of QA-K-8002A/B/C in closed position.	182.1.1. Overfilling of QA-V-8009 leading high moisture content air is sent to the plant air distribution network and to Air Drier package (#08) 182.2.1. Possible accumulation of water inside compressor package.	182.1.1.1. high level alarm in LI017	34. Check compressor vendor possible consequence in case of no water draining.	ENPPI
No/ Less	183. No/ Less Level	183.1. Failure of automatic draining device of QA-V-8009 in open position.	183.1.1. Flow misdirected of air to atmosphere leading to Pressure Less in QA-V-8009			

Session: (4) 22/07/2013

Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	184. Different Composition	184.1. Presence of flammable gas in the air intake of compressor QA-K-8002A/B/C 184.2. Presence of sand in the air intake of compressor QA-K-8002A/B/C	184.1.1. Possibility of flammable mixture formation inside the air compressors QA-K-8002A/B/C circuit 184.2.1. Possible damage of compressor QA-K-8002A/B/C	184.1.1.1. The air intake is installed in non-hazardous area; 15 m minimum distance from nearest hazardous area 184.2.1.1. Position of air intake to be establish according to the presence of sand in the area. 184.2.1.2. Compressor QA-K-...		

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Company: KPC
Facility: QASR Compressor station

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Session: (4) 22/07/2013

Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different (cont.)	184. Different Composition (cont.)	184.2. Presence of sand in the air intake of compressor QA-K-8002A/B/C (cont.)	184.2.1. Possible damage of compressor QA-K-8002A/B/C (cont.)	...8002A/B/C is installed inside a dedicated building.		
		184.3. Presence of mist in atmosphere.	184.3.1. Increase of pressure drop across air intake filter. 184.3.2. Increase of moisture content in the compressed air.	184.3.2.1. QA-V-8009 for water separation.		
	185. Deposition	185.1. No causes identified.				

Session: (4) 22/07/2013

Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	186. Others Maintenance	186.1. Failure or air compressor QA-K-8002A/B/C	186.1.1. Need to isolate the air compressor QA-K-8002A/B/C	186.1.1.1. Availability of spare compressor 186.1.1.2. Provision for fork lift entrance inside the compressor building.	35. Check with the compressor vendor the availability of manual valve in discharge line of compressor for isolation purposes.	ENPPI
		186.2. Maintenance on header to utility station.	186.2.1. Need for utility station header isolation.		36. Install a manual valve upstream ESDV-015 for isolation purposes.	
		186.3. Corrosion issues	186.3.1. Contact between QA-...		37. Check the need...	ENPPI

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Company: KPC
Facility: QASR Compressor station

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Session: (4) 22/07/2013

Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others (cont.)	186. Others Maintenance (cont.)	186.3. Corrosion issues (cont.)	...V-8009 (carbon steel) and level instrument stand pipe (stainless steel).		...for insulation kit between QA-V-8009 and level stand pipe of LT017 and LG018.	

Session: (4) 22/07/2013

Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	187. Other	187.1. No causes identified				

Session: (4) 22/07/2013

Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	188. Failure Utility	188.1. Loss of electrical power	188.1.1. Possible loss of process control 188.1.2. Stop or air compressor QA-K-8002A/B/C leading to Less Pressure in QA-V-8009	188.1.1.1. UPS provided as backup for all control system. 188.1.2.1. QA-V-8009 provides a buffer time of 3 min. Over all buffer time for instrument is equal to 15 min. (provided by QA-V-8010).	38. Check the possibility to connect any of compressor QA-K-8002A/B/C to emergency diesel generator.	ENPPI

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Node: (7) Utility air generation and compression including Air Compressor QA-K-8002 A/B/C (OT: °C; suction/discharge OP: barg) and Utility Air Receiver QA-V-8009 (OT:50 C; OP:9 barg)

Intention: Instrument and utility air system

Drawings: 3538-200-KKD-12300-1

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure (cont.)	188. Failure Utility (cont.)	188.1. Loss of electrical power (cont.)	188.1.2. Stop or air compressor QA-K-8002A/B/C leading to Less Pressure in QA-V-8009 (cont.)	188.1.2.2. QA-K-8002C connected to emergency diesel generation.	38. Check the possibility to connect any of compressor QA-K-8002A/B/C to emergency diesel generator. (cont.)	

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (4) 22/07/2013

Node: (8) Air Dryer Package QA-A-8005 A (OT: °C; OP: barg), instrument air receiver QA-V-8010 and instrument air distribution.

Intention: Instrument air drying and distribution.

Drawings: 3538-200-KKD-12300-1

3538-200-KKD-12300-2

3538-200-KKD-12301-1

3538-200-KKD-12364

3538-200-KKD-12365

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	189. No/ Less Flow	<p>189.1. Manual valve on inlet line of QA-A-8005A due to misoperation during switch over operation</p> <p>189.2. Manual valve on outlet line of QA-A-8005A due to misoperation during switch over operation</p> <p>189.3. Spurious closure of ESDV016 in nitrogen production inlet line</p> <p>189.4. Spurious closure of ESDV038 in nitrogen production inlet line</p>	<p>189.1.1. No Flow to plant to instrument air distribution / nitrogen generation package.</p> <p>189.1.2. Less Pressure in QA-V-8010.</p> <p>189.2.1. No Flow to instrument air distribution / nitrogen generation package</p> <p>189.2.2. More Pressure in QA-A-8005A/B</p> <p>189.3.1. Loss of air supply to nitrogen production package (#11)</p> <p>189.4.1. Loss of instrument air in Phase I and Phase II instrument air distribution network</p>	<p>189.1.1.1. QA-V-8010 provide a buffer time of 15 min.</p> <p>189.1.1.2. Operating procedure.</p> <p>189.1.1.3. Low flow alarm on FI-018.</p> <p>189.3.1.1. ESDV016 is equipped with limit switches with alarm in DCS</p> <p>189.4.1.1. ESDV038 is equipped with limit switches with alarm in DCS</p>		
More	190. More Flow	<p>190.1. Increased air consumption</p>	<p>190.1.1. Reduced resident time of air in QA-A-8005A/B leading to possible reduction of drying efficiency</p>	<p>190.1.1.1. AI-001A/B moisture analyser with a high water content alarm.</p>		

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Company: KPC
Facility: QASR Compressor station

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Node: (8) Air Dryer Package QA-A-8005 A (OT: °C; OP: barg), instrument air receiver QA-V-8010 and instrument air distribution.

Intention: Instrument air drying and distribution.

Drawings: 3538-200-KKD-12300-1

3538-200-KKD-12300-2

3538-200-KKD-12301-1

3538-200-KKD-12364

3538-200-KKD-12365

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	190. More Flow (cont.)	190.1. Increased air consumption (cont.)	190.1.2. Pressure Less in QA-V-8010			
		190.2. Increase air consumption in existing facility.	190.2.1. Same As-190.1.1 and 190.1.2	190.2.1.1. High flow alarm in FI-022 upstream tie in TI-034A/B 190.2.1.2. High flow alarm in FI-023upstream tie in TI-036A/B		
Reverse	191. Reverse Flow	191.1. Less Pressure in QA-V-8009	191.1.1. Possible compressed gas back flow from QA-V-8010 to QA-A-8005A/B leading to Less Pressure in instrument air distribution network 191.1.2. Possible compressed gas from existing facility to QA-v-8010.	191.1.1.1. Check valve in the inlet line of QA-V-8010 191.1.2.1. Check valve in the upstream tie in points #TI-0348 and #TI036A with the existing facility.		
Misdirected	192. Misdirected Flow	192.1. PSV-082A/B leakage.	192.1.1. Release of air in atmosphere leading to Less Pressure in QA-V-8010.			
		192.2. Manual valve on draining line of QA-V-8010 left open due to misoperation	192.2.1. Release of compressed air into atmosphere. No Flow of instrument air to users	192.2.1.1. Draining operation is constantly manned		

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Company: KPC
Facility: QASR Compressor station

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Session: (4) 22/07/2013

Node: (8) Air Dryer Package QA-A-8005 A (OT: °C; OP: barg), instrument air receiver QA-V-8010 and instrument air distribution.

Intention: Instrument air drying and distribution.

Drawings: 3538-200-KKD-12300-1

3538-200-KKD-12300-2

3538-200-KKD-12301-1

3538-200-KKD-12364

3538-200-KKD-12365

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	193. Higher Temperature	193.1. More Temperature from QA-V-8009 (#07)	193.1.1. Increase of temperature in QA-A-8005A/B leading to no significant consequences	193.1.1.1. Design temperature of QA-A-8005A/B is equal to QA-V-8009		
Less	194. Lower Temperature	194.1. Low ambient temperature	194.1.1. No significant consequences.			

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Node: (8) Air Dryer Package QA-A-8005 A (OT: °C; OP: barg), instrument air receiver QA-V-8010 and instrument air distribution.

Intention: Instrument air drying and distribution.

Drawings: 3538-200-KKD-12300-1

3538-200-KKD-12300-2

3538-200-KKD-12301-1

3538-200-KKD-12364

3538-200-KKD-12365

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	195. Higher Pressure	195.1. Manual valve on outlet line of QA-A-8005A due to misoperation during switch over operation	195.1.1. Pressure More in QA-A-8005A/B	195.1.1.1. Design Pressure of QA-A-8005A/B equal to design pressure of QA-V-8009		
		195.2. More Pressure from QA-V-8009 (#07)	195.2.1. Increase of pressure in QA-V-8010 leading to no significant consequences	195.2.1.1. Design pressure of QA-V-8010 is the same of QA-V-8009 195.2.1.2. High pressure alarm on PI081		
		195.3. External fire.	195.3.1. Over pressurization of...	195.3.1.1. PSV-082A/B sized for...		

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Company: KPC
Facility: QASR Compressor station

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Node: (8) Air Dryer Package QA-A-8005 A (OT: °C; OP: barg), instrument air receiver QA-V-8010 and instrument air distribution.

Intention: Instrument air drying and distribution.

Drawings: 3538-200-KKD-12300-1

3538-200-KKD-12300-2

3538-200-KKD-12301-1

3538-200-KKD-12364

3538-200-KKD-12365

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	195. Higher Pressure (cont.)	195.3. External fire. (cont.)	...QA-V-8009.	...fire case fire scenario.		
Less/ Vacuum	196. Less/ Vacuum Pressure	196.1. Pressure Less in QA-V-8009 (#07)	196.1.1. Reduction of efficiency of QA-A-8005A/B 196.1.2. Loss of instrument air to user leading to loss of process control and uncontrolled unit shut down	196.1.1.1. Refer to Less Pressure safeguards in QA-V-8009 (#07) 196.1.2.1. PZA-079A/B/C (2oo3 redundant logic) interlock to activate pressurized compressor unit shut down.		

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Node: (8) Air Dryer Package QA-A-8005 A (OT: °C; OP: barg), instrument air receiver QA-V-8010 and instrument air distribution.

Intention: Instrument air drying and distribution.

Drawings: 3538-200-KKD-12300-1

3538-200-KKD-12300-2

3538-200-KKD-12301-1

3538-200-KKD-12364

3538-200-KKD-12365

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	197. High Level	197.1. Delayed draining operation in QA-V-8010	197.1.1. Increase of water level in QA-V-8010 with consequent increase of moisture content in instrument air in the instrument air distribution network leading to operating/corrosion issues	197.1.1.1. QA-A-8005 drying package upstream QA-V-8010; no moisture is expected in QA-V-8010		
More	198. No/Less Level	198.1. No causes identified				

Worksheet

Company: KPC
Facility: QASR Compressor station

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Node: (8) Air Dryer Package QA-A-8005 A (OT: °C; OP: barg), instrument air receiver QA-V-8010 and instrument air distribution.

Intention: Instrument air drying and distribution.

Drawings: 3538-200-KKD-12300-1

3538-200-KKD-12300-2

3538-200-KKD-12301-1

3538-200-KKD-12364

3538-200-KKD-12365

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	199. Different Composition	199.1. Reduction of efficiency of drying unit QA-A-8005A/B	199.1.1. Increase moisture content in the instrument air distribution network leading to operating/corrosion issues	199.1.1.1. AI001A/B moisture analyzer in QA-A-8005A/B with high moisture content alarm in control room 199.1.1.2. Availability of QA-V-8010 for water separation.		
	200. Deposition	200.1. Possible molecular sieve entrainment in the instrument air flow.	200.1.1. Possible corrosion issue.	200.1.1.1. Air dryer package is equipped with dedicated filter downstream drying beds.		

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Node: (8) Air Dryer Package QA-A-8005 A (OT: °C; OP: barg), instrument air receiver QA-V-8010 and instrument air distribution.

Intention: Instrument air drying and distribution.

Drawings: 3538-200-KKD-12300-1

3538-200-KKD-12300-2

3538-200-KKD-12301-1

3538-200-KKD-12364

3538-200-KKD-12365

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	201. Others Maintenance	201.1. Saturation of air drying package	201.1.1. Need for isolation and switch over of QA-A-8005A/B	201.1.1.1. Availability of fixed lines and devices for switch over of QA-A-8005A/B		
		201.2. Corrosion issues	201.2.1. Refer To 199.1.1 and 200.1.1			

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Node: (8) Air Dryer Package QA-A-8005 A (OT: °C; OP: barg), instrument air receiver QA-V-8010 and instrument air distribution.

Intention: Instrument air drying and distribution.

Drawings: 3538-200-KKD-12300-1
3538-200-KKD-12300-2
3538-200-KKD-12301-1
3538-200-KKD-12364
3538-200-KKD-12365

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	202. Other	202.1. No causes identified				

Session: (4) 22/07/2013

Node: (8) Air Dryer Package QA-A-8005 A (OT: °C; OP: barg), instrument air receiver QA-V-8010 and instrument air distribution.

Intention: Instrument air drying and distribution.

Drawings: 3538-200-KKD-12300-1
3538-200-KKD-12300-2
3538-200-KKD-12301-1
3538-200-KKD-12364
3538-200-KKD-12365

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	203. Failure Utility	203.1. Loss of electrical power	203.1.1. Possible loss of process control 203.1.2. Failure of air drying package QA-A-8005A/B leading to increase moisture content in the instrument air distribution network leading to operating/corrosion issues	203.1.1.1. UPS provided as backup for all control system . 203.1.2.1. AI001A/B moisture analyzer in QA-A-8005A/B with high moisture content alarm in control room	39. Check the possibility to connect the QA-A-8005A/B control panel to emergency diesel generator.	ENPPI

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Node: (9) DELETED - included in node #07

Intention: Deleted

Drawings:

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	204. No/ Less Flow					

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Node: (10) DELETED - included in node #08

Intention: Deleted

Drawings:

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	205. No/ Less Flow					

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Facility: QASR Compressor station

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Session: (7) 28/07/2013

Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212
3538-200-KKD-12301-1
3538-200-KKD-12301-2

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	206. No/ Less Flow	<p>206.1. No Flow from QA-V-8009 (#07)</p> <p>206.2. Manual valve in outlet line of air to QA-A-8003 left closed due to misoperation</p> <p>206.3. Failure of QA-8003 nitrogen generator package.</p> <p>206.4. Manual valve in inlet line of QA-E-8007 left closed due to misoperation.</p> <p>206.5. Partial blockage of check valve downstream QA-8003.</p> <p>206.6. Spurious ESDV-024</p>	<p>206.1.1. Loss of nitrogen production leading to no nitrogen to seal gas compressor QA-K-8001A/B/C/D</p> <p>206.2.1. Same As 206.1.1.</p> <p>206.3.1. Same As 206.1.1.</p> <p>206.4.1. Same As 206.1.1.</p> <p>206.4.2. Possible overheating of QA-E-8007.</p> <p>206.5.1. Same As 206.1.1.</p> <p>206.6.1. No Flow of nitrogen to utility station leading to operational issues.</p>	<p>206.1.1.1. Low flow alarm on FI017</p> <p>206.1.1.2. PZA-085 low pressure alarm</p> <p>206.1.1.3. QA-V-8011 provides buffer time of 8 hours</p> <p>206.2.1.1. Operating procedures.</p> <p>206.4.1.1. Operating procedures.</p> <p>206.4.2.1. TZA006 high high temperature interlock to shut down electrical heating on QA-E-8007</p> <p>206.6.1.1. ESDV024 is equipped with limit switches with alarm in DCS</p> <p>206.6.1.2. Utility station is a discontinuous service.</p>		

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Company: KPC
Facility: QASR Compressor station

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Session: (7) 28/07/2013

Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212

3538-200-KKD-12301-1

3538-200-KKD-12301-2

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	206. No/ Less Flow (cont.)	206.6. Spurious ESDV-024 (cont.)	206.6.1. No Flow of nitrogen to utility station leading to operational issues. (cont.)	206.6.1.3. Low pressure alarm on a PI-095.		
More	207. More Flow	207.1. Increased nitrogen consumption	207.1.1. Less Pressure in QA-V-8011	207.1.1.1. PZA085A/B/C (2oo3 voting logic) interlock to close ESDV024 on nitrogen distribution to utility station to keep pressure in nitrogen for sealing of compressors		
		207.2. Increased consumption from nitrogen utility stations	207.2.1. Less Pressure in QA-V-8011	207.2.1.1. Design flow rate of nitrogen for utility station is minor compared with the flow rate guaranteed by QA-A-8003		
Reverse	208. Reverse Flow	208.1. No Flow of nitrogen	208.1.1. Possible gas backflow from compressor QA-K-8001A/B/C/D seals to the nitrogen production unit	208.1.1.1. Check valve in inlet line of nitrogen to compressor QA-K-8001A/B/C/D seals		
Misdirected	209. Misdirected Flow	209.1. PSV091A/B leakage	209.1.1. Release of nitrogen into the atmosphere leading to Less Pressure in nitrogen header circuit	209.1.1.1. Same As 207.1.1.1		
		209.2. PSV090A/B leakage	209.2.1. Release of nitrogen into the atmosphere leading to Less Pressure in QA-V-8011	209.2.1.1. Same As 207.1.1.1		
		209.3. Spurious opening of...	209.3.1. Release of nitrogen to...			

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Company: KPC
Facility: QASR Compressor station

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Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212
3538-200-KKD-12301-1
3538-200-KKD-12301-2

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	209. Misdirected Flow (cont.)	...BDV009 209.4. Manual valve in draining line of QA-V-8001 left open due to misoperation.	...atmosphere leading to Less Pressure in QA-V-8011 209.4.1. Release of nitrogen to atmosphere, leading to Less Pressure in QA-V- 8011.	209.4.1.1. Draining operation is constantly manned.	40. Provide a blind down stream manual valve in the draining line of QA-V-8011.	ENPPI

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Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212
3538-200-KKD-12301-1
3538-200-KKD-12301-2

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	210. Higher Temperature	210.1. Failure of TDIC013 putting to maximum power QA-E-8007 210.2. Inefficient cooling inside QA-A-8004	210.1.1. Overheating of QA-E-8007 leading to mechanical damage 210.2.1. Increase of temperature in QA-V-8011 leading to no significant consequence.	210.1.1.1. TZA014 high high temperature interlock to shut down electrical heating on QA-E-8007 210.1.1.2. TZA006 high high temperature interlock to shut down electrical heating on QA-E-8007 210.2.1.1. Design temperature of QA-V-8011 is the same of QA-A-8004.	41. Check the possibility to relocate TZA-014 down stream QA-E-8007	ENPPI
Less	211. Lower...	211.1. Failure of TDIC013...	211.1.1. Temperature Less in...			

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Company: KPC
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Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212
3538-200-KKD-12301-1
3538-200-KKD-12301-2

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less (cont.)	...Temperature	<p>...shutting down QA-E-8007</p> <p>211.2. Inefficient decompression in QA-A-8004</p> <p>211.3. Spurious opening of BDV-009</p>	<p>...nitrogen to compressor gas seals leading to mechanical seal damage.</p> <p>211.2.1. Depressurization in QA-A-8004 leading to temperature decrease in QA-E-8007 leading to no significant consequence.</p> <p>211.2.2. Depressurization leading to temperature decrease in QA-V-8011 leading to no significant consequence.</p> <p>211.3.1. Depressurization leading to temperature decrease in QA-V-8011 leading to no significant consequence.</p>	<p>211.1.1.1. Compressor QA-K-8001A/B/C/D is equipped with proper safeguard against low temperature.</p> <p>211.2.1.1. Design temperature of QA-E-8007 is equal to minimum depressurization temperature in QA-A-8004.</p> <p>211.2.2.1. Design temperature of QA-V-8011 is equal to minimum depressurization temperature.</p> <p>211.3.1.1. Design temperature of QA-V-8011 is equal to minimum depressurization temperature.</p>		

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Company: KPC
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Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212
3538-200-KKD-12301-1
3538-200-KKD-12301-2

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	212. Higher Pressure	<p>212.1. Failure of PIC087 increasing pressure of QA-A-8004 to QA-V-8011</p> <p>212.2. Failure of PIC086 increasing pressure of QA-A-8004 to QA-E-8007</p> <p>212.3. External fire</p>	<p>212.1.1. Increase of pressure in QA-V-8011 below the design pressure</p> <p>212.2.1. Possible overpressurization of QA-E-8007 and compressor QA-K-8001A/B/C seals.</p> <p>212.3.1. Overpressurization of QA-E-8007</p> <p>212.3.2. Overpressurization of QA-V-8011.</p>	<p>212.1.1.1. Design pressure of QA-V-8011 is the same of QA-A-8004</p> <p>212.1.1.2. High pressure alarm on PI087</p> <p>212.3.1.1. PSV091A/B sized for fire scenario</p> <p>212.3.2.1. PSV090A/B sized for fire scenario</p>	<p>42. Check with vendor of QA-A-8004 the adequate safeguards to prevent high pressure condition in the nitrogen distribution header.(eq. PSV,High high pressure interlock)</p>	ENPPI
Less/ Vacuum	213. Less/ Vacuum Pressure	<p>213.1. Failure of PIC087 decreasing pressure of QA-A-8004 to QA-V-8011</p>	<p>213.1.1. Reduced buffer capacity of QA-V-8011 leading to possible operating issues</p>	<p>213.1.1.1. Low pressure alarm on PI087</p> <p>213.1.1.2. PZA085A/B/C (2oo3 voting logic) closing the ESDV024 on nitrogen distribution to utility station to keep pressure in nitrogen header to compressors QA-K-8001A/B/C/D seals</p>		

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Facility: QASR Compressor station

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Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212

3538-200-KKD-12301-1

3538-200-KKD-12301-2

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less/ Vacuum (cont.)	213. Less/ Vacuum Pressure (cont.)	213.2. Failure of PIC086 decreasing pressure of QA-A- 8004 to QA-E-8007 213.3. Spurious opening of BDV-009	213.2.1. Less Pressure in nitrogen network to compressor QA-K- 8001A/B/C/D seals leading to compressor seal damage. 213.3.1. Same As 213.1.1 and 213.2.1	213.2.1.1. Same As 213.1.1.2 213.3.1.1. BDV-009 is equipped with limit switch with alarm in DCS 213.3.1.2. BDV-009 is equipped air accumulator to allow three strokes in case of instrument air failure.		

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Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212

3538-200-KKD-12301-1

3538-200-KKD-12301-2

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	214. Higher Level	214.1. Delayed draining operation on QA-V-8011	214.1.1. Increase of water level in QA-V-8011 leading to increased moisture content in the nitrogen network to compressors seals and consequent mechanical damage.	214.1.1.1. The nitrogen is produced by dry air; no moisture is expected in QA-V-8011 214.1.1.2. AI002 moisture analyzer inside QA-A-8003 with alarm for high H2O content	43. Check with Nitrogen Generator Package Vendor the Maximum moisture content in the produced nitrogen and evaluate the correspondent dew...	ENPPI

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Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212
3538-200-KKD-12301-1
3538-200-KKD-12301-2

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	214. Higher Level (cont.)	214.1. Delayed draining operation on QA-V-8011 (cont.)	214.1.1. Increase of water level in QA-V-8011 leading to increased moisture content in the nitrogen network to compressors seals and consequent mechanical damage. (cont.)	214.1.1.2. AI002 moisture analyzer inside QA-A-8003 with alarm for high H2O content (cont.)	...point at operating pressure at QA-V-8011	ENPPI
No/ Less	215. No/ Less Level	215.1. Prolonged draining operation	215.1.1. Release of nitrogen into the atmosphere leading to Pressure Less in QA-V-8011	215.1.1.1. The draining operation is constantly manned 215.1.1.2. Level Gauge to be visible from globe valve 215.1.1.3. Before starting draining operation ,it is forseen to depressurize QA-V-8011		
More	216. Higher Level	216.1. Failure closed of automatic draining system of QA-A-8004	216.1.1. Accumulation of liquid in QA-A-8004		44. Check with QA-A-8004 vendor possible consequence in case of no water draining./Excessive water draining	
No/ Less	217. No/ Less Level	217.1. Failure open of automatic draining system of QA-A-8004	217.1.1. Loss of Level in QA-A-8004			

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Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212
3538-200-KKD-12301-1
3538-200-KKD-12301-2

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	218. Different Composition	218.1. Inefficient generation of nitrogen in QA-A-8003	218.1.1. Distribution of nitrogen enriched with oxygen in the compressor QA-K-8001A/B/C/D seals leading to operational issues 218.1.2. Distribution of nitrogen enriched with oxygen in utility station leading to unsafe maintenance operation	218.1.1.1. AI002 oxygen analyzer with alarm for high oxygen content 218.1.1.2. In case the oxygen content in produced nitrogen is above defined level , nitrogen is vented to safe location. 218.1.2.1. Same As 218.1.1.1, 218.1.1.2		
	219. Deposition	218.2. Failure of QA-A-8003 219.1. No causes identified	218.2.1. Same As 218.1.1			

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Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212
3538-200-KKD-12301-1
3538-200-KKD-12301-2

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	220. Others Maintenance	220.1. Failure of QA-A-8003	220.1.1. Need to isolate, vent and open the circuit leading to nitrogen production stop.	220.1.1.1. Availability of fixed devices for isolation, venting and opening		

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Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212

3538-200-KKD-12301-1

3538-200-KKD-12301-2

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others (cont.)	220. Others Maintenance (cont.)	220.1. Failure of QA-A-8003 (cont.)	220.1.1. Need to isolate, vent and open the circuit leading to nitrogen production stop. (cont.)	220.1.1.2. QA-V-8011 provides buffer time of 8 hours		
		220.2. Failure of QA-A-8004	220.2.1. Need to isolate, vent and open the circuit leading to nitrogen production stop.	220.2.1.1. Availability of fixed devices for isolation, venting and opening	45. Check with QA-A-8004 Package Vendor the availability of a manual valves inside the package for isolation purposes	ENPPI
		220.3. Failure of ESDV 024	220.3.1. Need to isolate the utility station Nitrogen distribution header		46. Provide a manual valve upstream ESDV 024	ENPPI
		220.4. Corrosion issues	220.4.1. No causes identified			

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Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212

3538-200-KKD-12301-1

3538-200-KKD-12301-2

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	221. Other	221.1. No causes identified				

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Node: (11) Nitrogen system including Nitrogen Generation Package QA-A-8003 (OT: °C; OP: barg), Nitrogen Compression and Letdown Package QA-A-8004 (OT: °C; OP: barg), Nitrogen Receiver QA-V-8011 (OT: °C; OP: barg)

Intention: Nitrogen generation and distribution

Drawings: 3538-200-KKD-12212
3538-200-KKD-12301-1
3538-200-KKD-12301-2

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	222. Failure Utility	222.1. Loss of electrical power	<p>222.1.1. Possible loss of process control</p> <p>222.1.2. Failure of nitrogen generation package QA-A-8003 leading to inefficient nitrogen production</p> <p>222.1.3. Failure of Nitrogen Compressor and LETDown package QA-A-8004 leading to inefficient nitrogen production</p>	<p>222.1.1.1. UPS provided as backup for all control system .</p> <p>222.1.2.1. QA-A-8011 has intermittent operation and buffer time of 8 hours</p> <p>222.1.3.1. Same As 222.1.2.1</p>		

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Node: (12) DELETED - included in node #11

Intention: DELETED - included in node #11

Drawings:

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	223. No/ Less Flow					

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Session: (7) 28/07/2013

Node: (13) HP Fuel gas feed including Flash Gas Preheater QA-E-8002 (OT: 78 °C; OP: 65-34 barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12250

3538-200-KKD-12302

3538-200-KKD-12303-1

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	224. No/ Less Flow	<p>224.1. Spurious closure of ESDV012A in outlet line of QA-V-8005 (#05B)</p> <p>224.2. Spurious closure of ESDV002A in inlet line of QA-E-8002</p> <p>224.3. Spurious closure of ESDV003 in outlet line of QA-E-8002</p> <p>224.4. Failure close of PV003B</p> <p>224.5. Manual valves in inlet line of QA-E-8002 left closed due to misoperation</p>	<p>224.1.1. More Pressure in QA-V-8005 (#05B)</p> <p>224.1.2. Pressure Less in Fuel Gas KO Drum QA-V-8006 (#15)</p> <p>224.1.3. More temperature in a QA-E-8002 leading to possible mechanical damage.</p> <p>224.2.1. Same As 224.1.1, 224.1.2, 224.1.3</p> <p>224.3.1. Same As 224.1.1, 224.1.2, 224.1.3</p> <p>224.3.2. More Pressure in QA-E-8002</p> <p>224.4.1. Same As 224.1.1, 224.1.2, 224.1.3</p> <p>224.5.1. Same As 224.1.1, 224.1.2, 224.1.3</p>	<p>224.1.1.1. ESDV012 is equipped with limit switches with alarm in DCS</p> <p>224.1.3.1. FZA-026B to shutdown electrical heater QA-E-8002.</p> <p>224.1.3.2. Low flow alarm in FI-026A.</p> <p>224.2.1.1. ESDV0102A is equipped with limit switches with alarm in DCS</p> <p>224.3.1.1. ESDV003 is equipped with limit switches with alarm in DCS</p> <p>224.3.2.1. Design pressure of QA-E-8002 is equal to Design pressure of QA-V-8005 so no overpressurization is expected</p> <p>224.5.1.1. Operating procedures</p>		

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Company: KPC
Facility: QASR Compressor station

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Node: (13) HP Fuel gas feed including Flash Gas Preheater QA-E-8002 (OT: 78 °C; OP: 65-34 barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12250

3538-200-KKD-12302

3538-200-KKD-12303-1

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	224. No/ Less Flow (cont.)	224.6. Manual valves in outlet line of QA-E-8002 left closed due to misoperation	224.6.1. Same As 224.1.1, 224.1.2, 224.1.3, 224.3.2	224.6.1.1. Operating procedures 224.6.1.2. Same As 224.3.2.1.		
More	225. More Flow	225.1. Failure open of PV003B	225.1.1. Pressure More in Fuel Gas KO Drum QA-V-8006 (#15)			
Reverse	226. Reverse Flow	226.1. More pressure in node #14.	226.1.1. Possible fuel gas back flow from QA-V-8006 (#15) to QA-V-8005 (#05B) leading to no significant consequences	226.1.1.1. Check valve downstream QA-E-8002 226.1.1.2. After the installation of futur flash gas compressor the flash gas line from condensate fraction gas drum will be decommissioned.		
Misdirected	227. Misdirected Flow	227.1. Leakage of PSV031A/B	227.1.1. Unexpected flaring 227.1.2. No flow of gas to gas turbine	227.1.1.1. Operating instructions and periodic maintenance		

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Node: (13) HP Fuel gas feed including Flash Gas Preheater QA-E-8002 (OT: 78 °C; OP: 65-34 barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12250

3538-200-KKD-12302

3538-200-KKD-12303-1

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	228. Higher Temperature	228.1. Failure of TDIC008 putting to maximum power QA-E-8002	228.1.1. Overheating of QA-E-8002 leading to mechanical damage	228.1.1.1. TZA005 high high temperature interlock to shut down electrical heating on QA-E-8002 228.1.1.2. TZA007 high high temperature interlock to shut down electrical heating on QA-E-8002		
Less	229. Lower Temperature	229.1. Failure of TDIC008 shutting down QA-E-8002	229.1.1. Temperature Less in fuel gas to QA-V-8006 (#15) 229.1.2. Possible condensate formation leading to level rise in QA-V-8006 (#15).			

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Node: (13) HP Fuel gas feed including Flash Gas Preheater QA-E-8002 (OT: 78 °C; OP: 65-34 barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12250

3538-200-KKD-12302

3538-200-KKD-12303-1

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	230. Higher Pressure	230.1. External fire 230.2. Isolation of QA-E-8002 to misoperation 230.3. Failure of PDIC-917...	230.1.1. Overpressurization of QA-E-8002 230.2.1. Increase of temperature in isolated section leading to Overpressurization of QA-E-8002 230.3.1. Pressure More in Fuel...	230.1.1.1. PSV031A/B sized for fire scenario 230.2.1.1. Same As 230.1.1.1		

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Node: (13) HP Fuel gas feed including Flash Gas Preheater QA-E-8002 (OT: 78 °C; OP: 65-34 barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12250

3538-200-KKD-12302

3538-200-KKD-12303-1

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	230. Higher Pressure (cont.)	...opening PV003B.	...Gas KO Drum QA-V-8006 (#15)			
Less/ Vacuum	231. Less/ Vacuum Pressure	231.1. Refer To 224.1, 224.2, 224.3 (No Flow of Fuel gas)				

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Node: (13) HP Fuel gas feed including Flash Gas Preheater QA-E-8002 (OT: 78 °C; OP: 65-34 barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12250

3538-200-KKD-12302

3538-200-KKD-12303-1

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	232. No/ Less Level	232.1. Not applicable				
More	233. Higher Level	233.1. Not applicable				

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Node: (13) HP Fuel gas feed including Flash Gas Preheater QA-E-8002 (OT: 78 °C; OP: 65-34 barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12250

3538-200-KKD-12302

3538-200-KKD-12303-1

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	234. Different Composition	234.1. Level More in QA-V-8005 (#05B)	234.1.1. Possible two-phase flow in the line due to condensate carry over leading to possible hammering in the line and inside QAE-8002.	234.1.1.1. Refer to more level safeguards in QA-V-8005A (#05B).		

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Node: (13) HP Fuel gas feed including Flash Gas Preheater QA-E-8002 (OT: 78 °C; OP: 65-34 barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12250

3538-200-KKD-12302

3538-200-KKD-12303-1

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different (cont.)	234. Different Composition (cont.)	234.1. Level More in QA-V-8005 (#05B) (cont.)	234.1.2. Level More in QA-V-8006 (#15)			
	235. Deposition	235.1. Same As 234.1.				

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Node: (13) HP Fuel gas feed including Flash Gas Preheater QA-E-8002 (OT: 78 °C; OP: 65-34 barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12250

3538-200-KKD-12302

3538-200-KKD-12303-1

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	236. Others Maintenance	236.1. Failure of QA-E-8002	236.1.1. Need for isolation, venting, draining and purging	236.1.1.1. Availability of fixed devices for isolation venting & draining. High point vent and low point drains to be provided for line . 236.1.1.2. Provision for utility station for nitrogen purging.	47. Change the position between ESDV-003 & double block bleed manual isolation valves.	ENPPI
		236.2. Corrosion issues	236.2.1. no causes identified			

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Node: (13) HP Fuel gas feed including Flash Gas Preheater QA-E-8002 (OT: 78 °C; OP: 65-34 barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12250

3538-200-KKD-12302

3538-200-KKD-12303-1

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	237. Other	237.1. Incorrect opening of ESDV 002A during start up.	237.1.1. Possible hammering in down stream piping leading to potential mechanical damage of QA-E-8002.	237.1.1.1. PDZA 028 to inhibit the opening of main line valve (ESDV002A) if the differential pressure exceeds 2 bar.		

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Node: (13) HP Fuel gas feed including Flash Gas Preheater QA-E-8002 (OT: 78 °C; OP: 65-34 barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12250

3538-200-KKD-12302

3538-200-KKD-12303-1

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	238. Failure Utility	238.1. Loss of electrical power	238.1.1. Possible loss of process control 238.1.2. Failure of QA-E-8002 leading to Temperature Drop.	238.1.1.1. UPS provided as backup for all control system .		
		238.2. Loss of instrument air	238.2.1. Spurious closure of ESDV 101 A/B, ESDV103	238.2.1.1. ESDV 101 A/B, ESDV 103 equipped with limit switch (with alarm in DCS)		

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Node: (14) HP Fuel Gas Preheater QA-E-8003A/B (OT: °C; OP: barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12210

3538-200-KKD-12303-1

3538-200-KKD-12303-2

3538-200-KKD-12305

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	239. No/ Less Flow	<p>239.1. Spurious closure of ESDV004A in inlet line of QA-E-8003A/B</p> <p>239.2. Spurious closure of ESDV028A in outlet line of existent facility (Shams pipeline) during the startup</p> <p>239.3. Spurious closure of ESDV010A in outlet line of existent facility (Salam pipeline) during the startup</p> <p>239.4. Failure close of PV043A during normal operation.</p> <p>239.5. Failure close of PV043C during startup.</p>	<p>239.1.1. Less Pressure in Fuel Gas KO Drum QA-V-8006 (#15) leading to turbine shutdown.</p> <p>239.1.2. More Temperature in QA-E-8003A/B</p> <p>239.2.1. Same As 239.1.1</p> <p>239.3.1. Same As 239.1.1</p> <p>239.4.1. Same As 239.1.1</p> <p>239.4.2. Increase of Pressure in QA-E-8002 below design pressure</p> <p>239.5.1. Same As 239.1.1 and 239.4.2</p>	<p>239.1.1.1. ESDV004A is equipped with limit switches with alarm in DCS</p> <p>239.1.2.1. FZA-027B to shutdown electrical heater QA-E-8003A/B.</p> <p>239.1.2.2. Low flow alarm in FI-027A.</p> <p>239.2.1.1. ESDV028A is equipped with limit switches with alarm in DCS</p> <p>239.3.1.1. ESDV010A is equipped with limit switches with alarm in DCS</p> <p>239.4.2.1. Design pressure of QA-E-8002 is the same of compressor QA-K-001A/B/C/D design pressure so no overpressurization is expected</p>		

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Node: (14) HP Fuel Gas Preheater QA-E-8003A/B (OT: °C; OP: barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12210
3538-200-KKD-12303-1
3538-200-KKD-12303-2
3538-200-KKD-12305
3538-200-KKD-12354
3538-200-KKD-12368

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	239. No/ Less Flow (cont.)	239.6. Manual valves in inlet line of QA-E-8002 left closed due to misoperation	239.6.1. Same As 239.1.1	239.6.1.1. Operating procedures		
		239.7. Manual valves in outlet line of QA-E-8002 left closed due to misoperation	239.7.1. Same As 239.1.1, 239.4.2	239.7.1.1. Operating procedures 239.7.1.2. Same As 239.4.2.1		
More	240. More Flow	240.1. Failure open of PV043A	240.1.1. More Pressure in the line to Fuel Gas KO Drum QA-V-8006 (#15)			
Reverse	241. Reverse Flow	241.1. Flow No in this node	241.1.1. Possible fuel gas back flow from flash gas pre-heater QA-E-8002 (#13) to QA-E-8003A/B leading to no significant consequences	241.1.1.1. Check valve downstream QA-E-8003A/B		
		241.2. No flow from upstream existing facilities.	241.2.1. Possible fuel gas back flow from flash gas pre-heater QA-E-8003A to existing facility.	241.2.1.1. Check valve in injection point from existing facility.		
		241.3. No flow from gas compressor suction.	241.3.1. Possible fuel gas back flow from flash gas pre-heater QA-E-8003A to compressor suction.	241.3.1.1. Check valve in injection point from compressor suction.		
Misdirected	242. Misdirected Flow	242.1. Leakage of PSV037	242.1.1. Unexpected flaring	242.1.1.1. Operating instructions and periodic maintenance	:refer to-5	
			242.1.2. No flow of gas to gas...			

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Company: KPC
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Node: (14) HP Fuel Gas Preheater QA-E-8003A/B (OT: °C; OP: barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12210
3538-200-KKD-12303-1
3538-200-KKD-12303-2
3538-200-KKD-12305
3538-200-KKD-12354
3538-200-KKD-12368

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	242. Misdirected Flow (cont.)	242.1. Leakage of PSV037 (cont.)	...turbine			
		242.2. Leakage of PSV931	242.2.1. Same As 242.1.1, 242.1.2			
		242.3. Leakage of PSV097A/B	242.3.1. Same As 242.1.1, 242.1.2			
	243.	243.1. Spurious opening of BDV004A/B	243.1.1. Unexpected flaring	243.1.1.1. BDV004A/B equipped with limit switches with alarm in DCS	:refer to 2	
				243.1.1.2. BDV004A/B equipped air accumulator to allow three strokes in case of instrument air failure.		
			243.1.2. No/less flow to QA-V- 8006 (#15).	243.1.2.1. Same As 243.1.1.1, 243.1.1.2		
			243.1.3. Partial production losses	243.1.3.1. Same As 243.1.1.1, 243.1.1.2		
			243.1.4. Less Temperature in HP flare header , leading to possible hydrate formation in the flare header .	243.1.4.1. Same As 243.1.1.1, 243.1.1.2		

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Node: (14) HP Fuel Gas Preheater QA-E-8003A/B (OT: °C; OP: barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12210
3538-200-KKD-12303-1
3538-200-KKD-12303-2
3538-200-KKD-12305
3538-200-KKD-12354
3538-200-KKD-12368

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	244. Higher Temperature	244.1. Failure of TDIC012A/B putting to maximum power QA-E-8003A/B	244.1.1. Overheating of QA-E-8003A/B leading to mechanical damage	244.1.1.1. TZA009A/B high high temperature interlock to shut down electrical heating on QA-E-8003A/B 244.1.1.2. TZA011A/B high high temperature interlock to shut down electrical heating on QA-E-8003A/B		
Less	245. Lower Temperature	245.1. Failure of TDIC012A/B shutting down QA-E-8003A/B 245.2. isolation of fuel gas line from export pipeline after start-up	245.1.1. Temperature Less in fuel gas to QA-V-8006 (#15) 245.1.2. Possible condensate formation leading to level rise in QA-V-8006 (#15). 245.2.1. possible condensate/hydrate formation leading to plugging	245.2.1.1. methanol injection (refer to HAZID action # 3)		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (7) 28/07/2013

Node: (14) HP Fuel Gas Preheater QA-E-8003A/B (OT: °C; OP: barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12210
3538-200-KKD-12303-1
3538-200-KKD-12303-2
3538-200-KKD-12305
3538-200-KKD-12354
3538-200-KKD-12368

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	246. Higher Pressure	<p>246.1. External fire</p> <p>246.2. Isolation of QA-E-8003A/B to misoperation</p> <p>246.3. Failure open of PV043A</p>	<p>246.1.1. Overpressurization of QA-E-8003A/B</p> <p>246.2.1. Increase of temperature in isolated section leading to Overpressurization of QA-E-8003A/B</p> <p>246.3.1. More Pressure in QA-V-8006 (#15)</p>	<p>246.1.1.1. PSV037/PSV931 sized for fire scenario</p> <p>246.3.1.1. PSV097A/B in inlet line of QA-V-8006 size for control failure scenario</p> <p>246.3.1.2. PZA-044 high high pressure interlock</p>	<p>48. provide the action associated with the PZA -044 high high pressure interlock</p>	Enppi
Less/ Vacuum	247. Less/ Vacuum Pressure	247.1. Refer To 239.1, 239.6 (no flow fuel gas)				

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (7) 28/07/2013

Node: (14) HP Fuel Gas Preheater QA-E-8003A/B (OT: °C; OP: barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12210
3538-200-KKD-12303-1
3538-200-KKD-12303-2
3538-200-KKD-12305
3538-200-KKD-12354
3538-200-KKD-12368

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	248. No/ Less Level	248.1. Not applicable				
More	249. Higher Level	249.1. Not applicable				

Session: (7) 28/07/2013

Node: (14) HP Fuel Gas Preheater QA-E-8003A/B (OT: °C; OP: barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12210
3538-200-KKD-12303-1
3538-200-KKD-12303-2
3538-200-KKD-12305
3538-200-KKD-12354
3538-200-KKD-12368

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	250. Different Composition	250.1. Different Composition from existing facility due to presence of condensate (during start-up)	250.1.1. Possible two-phase flow in the line due to condensate carry over leading to possible hammering in the line and inside QAE-8003A/B. 250.1.2. Level More in QA-V-...	250.1.1.1. the tie-in point with existing pipeline is equipped with 12" condensate trap (minimum1500 mm height) 250.1.1.2. piping is slopped towards pipeline	49. Check with the vendor of fuel gas preheater QA-E-8003A/B that the fuel gas preheater is designed to operate with limited amount of entrained liquid 50. check the need to support 12" condensate trap at fuel gas tie-in point	Enppi Enppi

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (7) 28/07/2013

Node: (14) HP Fuel Gas Preheater QA-E-8003A/B (OT: °C; OP: barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12210
3538-200-KKD-12303-1
3538-200-KKD-12303-2
3538-200-KKD-12305
3538-200-KKD-12354
3538-200-KKD-12368

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different (cont.)	250. Different Composition (cont.)	250.1. Different Composition from existing facility due to presence of condensate (during start-up) (cont.)	...8006 (#15)			
	251. Deposition	251.1. no causes identified				

Session: (7) 28/07/2013

Node: (14) HP Fuel Gas Preheater QA-E-8003A/B (OT: °C; OP: barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12210
3538-200-KKD-12303-1
3538-200-KKD-12303-2
3538-200-KKD-12305
3538-200-KKD-12354
3538-200-KKD-12368

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	252. Others Maintenance	252.1. Failure of QA-E-8003A/B	252.1.1. Need for isolation, venting, draining and purging	252.1.1.1. Availability of fixed devices for isolation venting & draining. High point vent and low point drains to be provided for line . 252.1.1.2. Provision for utility station for nitrogen purging.		
		252.2. failure of PV-043A	252.2.1. Need for isolation, venting, draining and purging	252.2.1.1. availability of spare valve PV-043B		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (7) 28/07/2013

Node: (14) HP Fuel Gas Preheater QA-E-8003A/B (OT: °C; OP: barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12210
3538-200-KKD-12303-1
3538-200-KKD-12303-2
3538-200-KKD-12305
3538-200-KKD-12354
3538-200-KKD-12368

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others (cont.)	252. Others Maintenance (cont.)	252.3. Corrosion issues	252.3.1. no causes identified			

Session: (7) 28/07/2013

Node: (14) HP Fuel Gas Preheater QA-E-8003A/B (OT: °C; OP: barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12210
3538-200-KKD-12303-1
3538-200-KKD-12303-2
3538-200-KKD-12305
3538-200-KKD-12354
3538-200-KKD-12368

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	253. Other	253.1. Incorrect opening of ESDV 004A during start up.	253.1.1. Possible hammering in down stream piping leading to potential mechanical damage .	253.1.1.1. PDZA 035 to inhibit the opening of main line valve (ESDV004A) if the differential pressure exceeds 2 bar.		
		253.2. Incorrect opening of ESDV 028A during start up (Shams pipeline).	253.2.1. Possible hammering in down stream piping leading to potential mechanical damage .	253.2.1.1. PDZA 925 to inhibit the opening of main line valve (ESDV028A) if the differential pressure exceeds 2 bar.		
		253.3. Incorrect opening of ESDV 010A during start up (Salam pipeline).	253.3.1. Possible hammering in down stream piping leading to potential mechanical damage .	253.3.1.1. PDZA 099 to inhibit the opening of main line valve (ESDV010A) if the differential pressure exceeds 2 bar.		

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Session: (7) 28/07/2013

Node: (14) HP Fuel Gas Preheater QA-E-8003A/B (OT: °C; OP: barg)

Intention: Flash gas feed to fuel gas system

Drawings: 3538-200-KKD-12210
3538-200-KKD-12303-1
3538-200-KKD-12303-2
3538-200-KKD-12305
3538-200-KKD-12354
3538-200-KKD-12368

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	254. Failure Utility	<p>254.1. Loss of electrical power</p> <p>254.2. Loss of instrument air</p>	<p>254.1.1. Possible loss of process control</p> <p>254.1.2. Failure of QA-E-8003A/B leading to Less Temperature</p> <p>254.2.1. Spurious closure of ESDV004A</p> <p>254.2.2. Spurious opening of BDV004A/B</p>	<p>254.1.1.1. UPS provided as backup for all control system .</p> <p>254.2.1.1. ESDV004A equipped with limit switches (with alarm in DCS)</p> <p>254.2.2.1. BDV004A/B equipped with limit switches (with alarm in DCS)</p> <p>254.2.2.2. BDV004A/B equipped air accumulator to allow three strokes in case of instrument air failure.</p>		

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Facility: QASR Compressor station

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas

Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	255. No/ Less Flow (gas)	255.1. No Flow from fuel gas pre-heating circuit (#14)	255.1.1. Pressure Less in this node leading to gas turbine shutdown and loss of production. 255.1.2. Pressure Less in this node leading to shutdown of existing power generation. 255.1.3. No flow to LP fuel gas circuit (#17) 255.1.4. More Temperature in QA-E-8005A/B	255.1.1.1. Low flow alarm on FI004B 255.1.1.2. Low low flow alarm on FI004A 255.1.2.1. Low low pressure alarm on PI-044B. 255.1.4.1. FZA-004A to shutdown electrical heater QA-E-8005A/B and shutdown the compressors.	51. Check with SOLAR the possibility to eliminate FZA-004A interlock to stop the compressor and relay on safeguard in turbine skid.	SOLAR
		255.2. Demister Partial Blockage	255.2.1. Pressure More in QA-V-8006 255.2.2. Same As 255.1.1, 255.1.2, 255.1.3, 255.2.1	255.2.1.1. PDI 919 High Alarm across demister 255.2.1.2. Same As 255.1.1.1, 255.1.1.2, 311.1.1.3		
		255.3. Manual valves in the...	255.3.1. Same As 255.1.1,...	255.3.1.1. Operating procedures.		

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Company: KPC
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Session: (8) 29/07/2013

Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas

Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	255. No/ Less Flow (gas) (cont.)	<p>...suction line of QA-V-8006 closed due to misoperation</p> <p>255.4. Manual valves in the suction line of mercury removal package QA-A-8001 (#16) closed due to misoperation</p> <p>255.5. Manual valve upstream/downstream heat exchanger QA-E-8005A/B left closed due to misoperation</p> <p>255.6. Manual valve upstream/downstream filter QA-S8001A/B left closed due to misoperation</p> <p>255.7. Blockage of QA-S-8001A/B</p> <p>255.8. Failure close of PV-904</p> <p>255.9. Gas turbine shutdown.</p>	<p>...255.1.2, 255.1.3, 255.2.1</p> <p>255.4.1. Same As 255.1.1, 255.1.2, 255.1.3, 255.2.1</p> <p>255.5.1. Same As 255.1.1, 255.1.2, 255.1.3, 255.2.1</p> <p>255.6.1. Same As 255.2.1, 255.2.2</p> <p>255.7.1. Same As 255.1.1, 255.1.2, 255.1.3, 255.2.1</p> <p>255.8.1. Pressure Less in this node leading to shutdown of existing power generation.</p> <p>255.9.1. Pressure More in QA-V-8006 leading to no significant consequences</p>	<p>255.3.1.1. Operating procedures. (cont.)</p> <p>255.4.1.1. Operating procedures</p> <p>255.5.1.1. Same As 255.4.1.1</p> <p>255.6.1.1. Same As 255.4.1.1</p> <p>255.7.1.1. High differential pressure alarm in PDI-063A/B</p> <p>255.8.1.1. Existing power generation is dual fuel.</p>		
More	256. More Flow (gas)	256.1. Failure open of PV043A (#14)	256.1.1. Overpressurization of QA-V-8006	256.1.1.1. PSV097A/B in inlet line of QA-V-8006 sized for control...		

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Company: KPC
Facility: QASR Compressor station

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas

Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	256. More Flow (gas) (cont.)	256.1. Failure open of PV043A (#14) (cont.)	256.1.1. Overpressurization of QA-V-8006 (cont.)	...failure scenario 256.1.1.2. PZA-004A to close ESDV-003, ESD004A/B		
		256.2. Failure open of PV003B (#13)	256.2.1. Overpressurization of QA-V-8006	256.2.1.1. PSV097A/B in inlet line of QA-V-8006 sized for control failure scenario 256.2.1.2. PZA-004A to close ESDV-003, ESD004A/B		
		256.3. Increase consumption by users.	256.3.1. No significant consequences			
Reverse	257. Reverse Flow (gas)	257.1. No flow of fuel gas	257.1.1. No significant consequences			
Misdirected	258. Misdirected Flow (gas)	258.1. Partial leaking of PSV-045A/B	258.1.1. Unexpected flaring 258.1.2. Loss of production 258.1.3. Possible condensate / Hydrates formation vent line downstream PSV045A/B	258.1.1.1. Operating and maintenance procedures	:Refer To 2	
		258.2. Partial leaking of PSV-048A/B, PSV-050A/B	258.2.1. Same As 258.1.1, 258.1.2, 258.1.3			
		258.3. Spurious opening of...	258.3.1. Unexpected flaring	258.3.1.1. BDV006 equipped...	:Refer To 2	

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas

Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	258. Misdirected Flow (gas) (cont.)	...BDV006	258.3.1. Unexpected flaring (cont.)	...with limit switches with alarm in DCS	52. Check the possibility to relocate the BDV-006 downstream QA-S-8001A/B.	ENPPI
			258.3.2. No flow of fuel gas leading to shut down of gas turbine and consequent loss of production.	258.3.2.1. Same As 243.1.1.1, 243.1.1.2		
			258.3.3. Partial production losses	258.3.3.1. Same As 243.1.1.1, 243.1.1.2		
			258.3.4. Less Temperature in HP flare header , leading to possible hydrate formation in the flare header .	258.3.4.1. Same As 243.1.1.1, 243.1.1.2		
		258.4. Spurious opening of PV-052	258.4.1. Unexpected flaring			
			258.4.2. Loss of production.	258.4.2.1. PV-052 is equipped with limit switch and alarming control in DCS.		
				258.4.2.2. PV-052 is equipped with air bottle to improve reliability.		
No/ Less	259. No/ Less Flow (condensate)	259.1. Spurious closure of ESDV-005	259.1.1. More Level in QA-V-8006	259.1.1.1. ESDV-005 is equipped with limit switches (with alarm in...		

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	259. No/ Less Flow (condensate) (cont.)	259.1. Spurious closure of ESDV-005 (cont.) 259.2. Failure close of LV-006 259.3. Manual valves in the condensate outlet line of QA-V-8006 closed due to misoperation 259.4. Partial blockage of check valve in discharge line of QA-V-8006 due to mechanical damage	259.1.1. More Level in QA-V-8006 (cont.) 259.2.1. Same As 259.1.1 259.3.1. Same As 259.1.1 259.4.1. Same As 259.1.1	...DCS) 259.2.1.1. LV 006 is equipped with limit switches (with alarm in DCS) 259.3.1.1. Operating procedures		
More	260. More Flow (condensate)	260.1. Failure open LV-006	260.1.1. Less level in QA-V-8006	260.1.1.1. LV-006 is equipped with limit switches (with alarm in DCS)		
Reverse	261. Reverse Flow (condensate)	261.1. More Pressure from QA-V-8008 (#22)	261.1.1. Possible back flow of gas from QA-V-8008 to QA-V-8006	261.1.1.1. Check valve in the QA-V-8006 discharge line		
Misdirected	262. Misdirected (condensate)	262.1. No causes identified				

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	263. Higher Temperature	<p>263.1. More Temperature from pre-heating circuit (#14)</p> <p>263.2. Failure of TDIC048A/B putting to maximum power QA-E-8005A/B</p>	<p>263.1.1. Increase of temperature QA-V-8006 leading to no significant consequences in this node</p> <p>263.2.1. Overheating of QA-E8005A/B leading to mechanical damage</p> <p>263.2.2. More temperature of gas turbine leading to possible mechanical damage.</p>	<p>263.1.1.1. Design temperature of QA-V-8006 is equal to Design temperature of upstream pre-heating circuit (#14)</p> <p>263.2.1.1. TZA019A/B high high temperature interlock to shut down electrical heating on QA-E-8005A/B</p> <p>263.2.1.2. TZA022A/B high high temperature interlock to shut down electrical heating on QA-E-8005A/B</p> <p>263.2.2.1. Same As 263.2.1.1, 263.2.1.2</p>		
Less	264. Lower Temperature	<p>264.1. Failure of TDIC048A/B shutting down QA-E-8005A/B</p> <p>264.2. Low ambient temperature.</p>	<p>264.1.1. Temperature Less in fuel gas to gas turbine with possible condensation and excess of firing with mechanical damage of burners</p> <p>264.2.1. Possible condensate / hydrates formation in the inlet line of PSV045A/B</p>	<p>264.1.1.1. TDZA-034 low low differential temperature interlock to stop the compressor train (ESD level 4).</p> <p>264.1.1.2. Low temperature alarm on TI-020A</p> <p>264.2.1.1. Inlet line of PSV045A/B is hot insulated and sloped to main suction line in order to...</p>	<p>53. Due to operability issues, check with SOLAR the possibility to eliminate TDZA-034 interlock and relay on low temperature safeguard in turbine skid.</p> <p>:Refer To 2</p>	SOLAR

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas

Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less (cont.)	264. Lower Temperature (cont.)	264.2. Low ambient temperature. (cont.)	<p>264.2.1. Possible condensate / hydrates formation in the inlet line of PSV045A/B (cont.)</p> <p>264.2.2. Possible condensate / hydrates formation in the inlet line of PSV048A</p> <p>264.2.3. Possible condensate / hydrates formation in the inlet line of PSV050A</p> <p>264.2.4. Possible wax formation/freezing in the condensate discharge line</p> <p>264.2.5. Possible wax formation in the level instrument connections, leading to operating problems.</p>	<p>...drain the condensate.</p> <p>264.2.2.1. Inlet line of PSV048A/B is hot insulated and sloped to main suction line in order to drain the condensate.</p> <p>264.2.3.1. Inlet line of PSV050A/B is hot insulated and sloped to main suction line in order to drain the condensate.</p> <p>264.2.4.1. The draining line is insulated upstream LV006 control valve.</p>	<p>:Refer To 2 (cont.)</p> <p>: Refer To 5</p>	

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas

Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	265. Higher Pressure	<p>265.1. Demister of QA-V-8006 partial blockage</p> <p>265.2. Refer To 256.1 (Failure open of PV043A (#14))</p> <p>265.3. Refer To 256.3 (Failure open of PV003B (#13))</p> <p>265.4. External fire .</p> <p>265.5. External fire .</p> <p>265.6. External fire .</p>	<p>265.1.1. Increase of the pressure in QA-V-8006 below design pressure</p> <p>265.2.1. Overpressurization of QA-V-8006</p> <p>265.3.1. Same As 252.2.1</p> <p>265.4.1. Over pressurization of QA-V-8001A leading to mechanical damage</p> <p>265.5.1. Over pressurization of QA-E-8005A/B leading to mechanical damage</p> <p>265.6.1. Over pressurization of QA-S-8001A leading to...</p>	<p>265.1.1.1. PSV097A/B in inlet line of QA-V-8006 sized for control failure scenario</p> <p>265.1.1.2. PZA-004A to close ESDV-003, ESD004A/B</p> <p>265.1.1.3. High differential pressure on PDIT909 across demister</p> <p>265.2.1.1. PSV097A/B in inlet line of QA-V-8006 sized for control failure scenario</p> <p>265.2.1.2. PZA-004A to close ESDV-003, ESD004A/B</p> <p>265.4.1.1. PSV 045A/B sized for fire case.</p> <p>265.5.1.1. PSV 048A/B sized for fire case.</p> <p>265.6.1.1. PSV 050A/B sized for fire case.</p>		

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas

Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	265. Higher Pressure (cont.)	265.6. External fire . (cont.)	...mechanical damage	265.6.1.1. PSV 050A/B sized for fire case. (cont.)	54. Check the possibility to install high high pressure interlock downstream PV-904 in order to close a dedicated ESDV in the line to existing power generation (include the new interlock in the cause & effect diagram).	ENPPI
		265.7. Failure close of PV052	265.7.1. Increase of pressure in QA-S-8001A/B below design pressure	265.7.1.1. Design pressure of QA-S-8001 equal to design pressure of QA-V-8006 so no overpressurization is expected		
		265.8. Failure open of PV904	265.8.1. More Pressure to existing power generation leading to possible mechanical damage	265.8.1.1. Existing power generation is equipped with high pressure safeguard.		
Less/ Vacuum	266. Less/ Vacuum Pressure	266.1. No Flow from fuel gas pre-heating circuit (#14)	266.1.1. Pressure Less in this node leading to possible gas turbine shut down and consequent production losses	266.1.1.1. Low low pressure alarm on PI044B		
		266.2. Failure open of PV052	266.2.1. Unexpected flaring	266.2.1.1. PV052 equipped with limit switches with alarm in DCS 266.2.1.2. PV052 equipped air accumulator to improve reliability.		

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Company: KPC
Facility: QASR Compressor station

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less/ Vacuum (cont.)	266. Less/ Vacuum Pressure (cont.)	266.2. Failure open of PV052 (cont.)	266.2.2. Loss of production 266.2.3. Pressure Less in the fuel gas distribution to users leading to operating upset			

Session: (8) 29/07/2013

Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	267. Higher Level	267.1. Spurious closure of ESDV005 267.2. Failure close of LV 106	267.1.1. Overfilling of QA-V-8006 leading to liquid carry over to QA- E-8005A/B with possible damage 267.2.1. Same As 267.1.1	267.1.1.1. ESDV005 is equipped with limit switches (with alarm in DCS). 267.1.1.2. LZA005A (High High) Interlock to close fuel gas inlet line 267.1.1.3. LIC 006 with high level alarm. 267.2.1.1. LV 106 is equipped with limit switches (with alarm in DCS) 267.2.1.2. Same As 267.1.1.2		

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	267. Higher Level (cont.)	267.3. Manual valves in the condensate outlet line of QA-V-8001A closed due to misoperation	267.3.1. Same As 267.1.1	267.3.1.1. Operating procedures. 267.3.1.2. Same As 267.1.1.2		
No/ Less	268. No/ Less Level	268.1. Failure open of LV 106	268.1.1. Gas blow by to the Closed Drain drum QA-V-8008 (#21) leading to More Pressure in QA-V-8008.	268.1.1.1. LZA005B (low low) Interlock to close the shutdown valve ESDV005 on liquid discharge line.		

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	269. Different Composition	269.1. Refer To 264.2 (low temperature)				
	270. Deposition	270.1. No causes identified.				

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	271. Others Maintenance	<p>271.1. Periodic maintenance</p> <p>271.2. Maintenance of LV 006</p> <p>271.3. Fouling of QA-E-8005A</p> <p>271.4. Plugging of QA-S-8001A</p>	<p>271.1.1. Need for isolation venting , draining and purging of the QA-V-8006.</p> <p>271.2.1. Needs to operate by-pass line of LV 006</p> <p>271.3.1. Need for isolation venting , draining and purging of the QA-E-8005A.</p> <p>271.4.1. Need for isolation venting , draining and purging of theQA-S-8001A.</p>	<p>271.1.1.1. Availability of fixed devices for isolation venting & draining . High point vent and low point drains to be provided for line .</p> <p>271.1.1.2. Provision for utility station for nitrogen purging.</p> <p>271.2.1.1. Level gauge of all condensate drums shall be visible from manual valve of by-pass line of relevant level control valve installed on liquid discharge line.</p> <p>271.3.1.1. Availability of spare heat exchanger QA-E-8005B. Availability of fixed devices for isolation venting & draining. High point vent and low point drains to be provided for line.</p> <p>271.3.1.2. Provision for utility station for nitrogen purging.</p> <p>271.4.1.1. Availability of spare heat exchanger QA-S-8001B. Availability of fixed devices for isolation venting & draining. High point vent and low point drains to be provided for line.</p>		

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others (cont.)	271. Others Maintenance (cont.)	271.4. Plugging of QA-S-8001A (cont.)	271.4.1. Need for isolation venting , draining and purging of theQA-S-8001A. (cont.)	271.4.1.2. Provision for utility station for nitrogen purging.		
		271.5. Corrosion issues	271.5.1. no causes identified			

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	272. Other	272.1. No causes identified.				

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Node: (15) HP fuel gas feed including HP Fuel Gas KOD QA-V-8006 (OT: °C, OP: barg), HP fuel gas superheater QA-E-8005A/B (OT: °C, OP: barg) and HP Fuel Gas Filter (OT: °C, OP: barg)

Intention: Condensate separation

Drawings: 3538-200-KKD-12305

3538-200-KKD-12306

3538-200-KKD-12307

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	273. Failure Utility	273.1. Loss of electrical power	273.1.1. Possible loss of process control. 273.1.2. Failure of QA-E-8005A/B leading to less temperature.	273.1.1.1. UPS provided as backup for all control system . 273.2.1.1. BDV006 is equipped with limit switches (with alarm in DCS) 273.2.1.2. BDV006 equipped air accumulator to allow three strokes in case of instrument air failure.		
		273.2. Loss of instrument air	273.2.1. Spurious opening of BDV006			

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Node: (16) DELETED - included in node #15

Intention: DELETED - included in node #15

Drawings:

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	274. No/ Less Flow					

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Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	275. No/ Less Flow (gas)	<p>275.1. No flow from HP fuel gas header (#15)</p> <p>275.2. Spurious closure of ESDV025 on inlet line to existing facility when the line is in use</p> <p>275.3. Spurious closure of ESDV040 on inlet line to existing facility when the line is in use</p> <p>275.4. Manual valve on inlet line of QA-E-8006 left closed due to misoperation</p>	<p>275.1.1. Less Pressure in QA-V-8007 leading to possible no flow to flare head and flame out.</p> <p>275.2.1. Less Pressure in QA-V-8007 leading to possible no flow to flare head and flame out.</p> <p>275.2.2. More Temperature in QA-E-8006 leading to possible mechanical damage</p> <p>275.3.1. Same As 275.1.1.</p> <p>275.4.1. Same As 275.1.1.</p>	<p>275.1.1.1. PIC-054 will activate the backup fuel gas from Salam/Shams pipeline.</p> <p>275.1.1.2. PZA-053B low low pressure interlock to open ESDV025 and ESDV040 on backup fuel gas line from existing facility.</p> <p>275.2.1.1. ESDV025 is equipped with limit switches with alarm in DCS.</p> <p>275.2.1.2. Low flow alarm on FI028A</p> <p>275.2.2.1. FZA028B low low flow interlock to shut down QA-E-8006</p> <p>275.3.1.1. ESDV040 is equipped with limit switches with alarm in DCS.</p> <p>275.3.1.2. Same As 358.1.1.2, 358.1.2.1</p> <p>275.4.1.1. Operating procedures</p> <p>275.4.1.2. Same As 2, 2.</p>	<p>55. Configure the manual valves in the tie in point upstream...</p>	

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Company: KPC
Facility: QASR Compressor station

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Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	275. No/ Less Flow (gas) (cont.)	275.4. Manual valve on inlet line of QA-E-8006 left closed due to misoperation (cont.)	275.4.1. Same As 275.1.1. (cont.)	275.4.1.2. Same As 275.1.1. (cont.)	...QA-E-8006 from Shams pipeline as locked open. 56. Configure the manual valves across PV-054B as a locked open.	
		275.5. Failure close of PV054B downstream QA-E-8006	275.5.1. Same As 275.1.1.			
		275.6. Partial blockage of demister of QA-V-8007	275.6.1. Same As 275.1.1.	275.6.1.1. Availability of high differential pressure alarm in PDI922 across the demister		
More	276. More Flow (gas)	276.1. Failure open of PV54B downstream QA-E-8006	276.1.1. More Pressure in QA-V- 8007 (#18)			
Reverse	277. Reverse Flow (gas)	277.1. No Flow from upstream existing unit	277.1.1. Possible gas back flow from HP fuel gas header (#016) to existing facility 277.1.2. Possible gas back flow from downstream existing facility to QA-V-8007 leading to More Pressure	277.1.1.1. Check valve upstream injection point 277.1.2.1. Double check valve of dissimilar type upstream the tie-in point with the existing facility		
Misdirected	278. Misdirected Flow (gas)	278.1. Partial leaking of PSV914A/B	278.1.1. Unexpected flaring	278.1.1.1. Operating and maintenance procedures		

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Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	278. Misdirected Flow (gas) (cont.)	278.1. Partial leaking of PSV914A/B (cont.)	278.1.2. Loss of production		:Refer To 2	
			278.1.3. Possible condensate / Hydrates formation vent line downstream PSV914A/B			
		278.2. Partial leaking of PSV055A/B	278.2.1. Unexpected flaring	278.2.1.1. Operating and maintenance procedures		
			278.2.2. Loss of production		:Refer To 2	
			278.2.3. Possible condensate / Hydrates formation vent line downstream PSV055A/B			
		278.3. Partial leaking of PSV-932A/B	278.3.1. unexpected fuel gas to cold vent	278.3.1.1. Operating and maintenance procedures	57. Check if the PSV-932A/B discharge is suitable for existing design of cold vent header including the presence of flame arrestor at the stack	Enppi
				278.3.1.2. cold vent is provided with flame arrestor		
			278.3.2. Loss of production			
			278.3.3. Possible condensate / Hydrates formation vent line downstream PSV032A/B		:Refer To 2	
No/ Less	279. No/ Less Flow (condensate)	279.1. Spurious closure of ESDV-006	279.1.1. More Level in QA-V-8007	279.1.1.1. ESDV-006 is equipped with limit switches (with alarm in...		

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Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	279. No/ Less Flow (condensate) (cont.)	279.1. Spurious closure of ESDV-006 (cont.) 279.2. Failure close of LV-009 279.3. Manual valves in the condensate outlet line of QA-V- 8006 closed due to misoperation 279.4. Partial blockage of check valve in discharge line of QA-V- 8007 due to mechanical damage .	279.1.1. More Level in QA-V-8007 (cont.) 279.2.1. Same As 279.1.1 279.3.1. Same As 279.1.1 279.4.1. Same As 279.1.1	...DCS) 279.2.1.1. LV 009 is equipped with limit switches (with alarm in DCS) 279.3.1.1. Operating procedures		
More	280. More Flow (condensate)	280.1. Failure open LV-009	280.1.1. Less level in QA-V-8007	280.1.1.1. LV-006 is equipped with limit switches (with alarm in DCS)		
Reverse	281. Reverse Flow (condensate)	281.1. More Pressure from QA- V-8008 (#22)	281.1.1. Possible back flow of gas from QA-V-8008 to QA-V-8007	281.1.1.1. Check valve in the QA- V-8006 discharge line		
Misdirected	282. Misdirected (condensate)	282.1. No causes identified				

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Company: KPC
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Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	283. Higher Temperature	283.1. Failure of TDIC035A/B putting to maximum power QA-E-8006A/B	283.1.1. Overheating of QA-E-8006A/B leading to mechanical damage	283.1.1.1. TZA037 high high temperature interlock to shut down electrical heating on QA-E-8006 283.1.1.2. TZA036 high high temperature interlock to shut down electrical heating on QA-E-8006		
Less	284. Lower Temperature	284.1. Failure of TDIC035A/B shutting down QA-E-8006A/B	284.1.1. Temperature Less in fuel gas to QA-V-8007 leading to condensate/hydrate formation	284.1.1.1. QA-V-8007 is sized to separate the condensate. 284.1.1.2. Low temperature alarm on TI-028 from Shams pipeline 284.1.1.3. Low temperature alarm on TI-027 from Salam pipeline	58. Relocate the methanol injection point in the common header from Shams pipeline upstream the HP/LP fuel gas branches. 59. Relocate the methanol injection point in the common header from Salam pipeline upstream the HP/LP fuel gas branches. 60. Install electrical tracing on LP fuel gas backup line from Shams/Salam pipelines including the inlet line to QA-V-8007.	ENPPI

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Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less (cont.)	284. Lower Temperature (cont.)	284.2. Low ambient temperature.	<p>284.2.1. Possible condensate / hydrates formation in the inlet line of PSV914A/B</p> <p>284.2.2. Possible condensate / hydrates formation in the inlet line of PSV055A</p> <p>284.2.3. Possible condensate / hydrates formation in the inlet line of PSV932A</p> <p>284.2.4. Possible wax formation/freezing in the condensate discharge line</p> <p>284.2.5. Possible wax formation in the level instrument connections, leading to operating problems.</p>	<p>284.2.1.1. Inlet line of PSV045A/B is hot insulated and sloped to main suction line in order to drain the condensate.</p> <p>284.2.2.1. Inlet line of PSV048A/B is hot insulated and sloped to main suction line in order to drain the condensate.</p> <p>284.2.3.1. Inlet line of PSV050A/B is hot insulated and sloped to main suction line in order to drain the condensate.</p> <p>284.2.4.1. The draining line is insulated upstream LV006 control valve.</p>	<p>:Refer To 2</p> <p>: Refer To 5</p>	

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Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	285. Higher Pressure	285.1. Failure open of PV054B downstream QA-E-8006	285.1.1. Overpressurization of QA-V-8007 leading to mechanical damage	285.1.1.1. PSV055A/B sized for control valve failure scenario 285.1.1.2. PZA-053A high high pressure interlock to close ESDV025 and ESDV040 from backup gas from pipelines and ESDV-007 on HP fuel gas line. 285.1.1.3. RO-019 downstream PV-054B		
		285.2. Failure open of PV054A in HP header	285.1.2. More Pressure in QA-E-8006 leading to no significant consequences 285.2.1. Overpressurization of QA-V-8007 leading to mechanical damage	285.1.2.1. Design Pressure of QA-E-8006 is consistent with design pressure of existing facility 285.2.1.1. PSV055A/B sized for control valve failure scenario 285.2.1.2. PZA-053A high high pressure interlock to close ESDV025 and ESDV040 from backup gas from pipelines and ESDV-007 on HP fuel gas line.		
Less/ Vacuum	286. Less/ Vacuum Pressure	286.1. Failure closed of PV054B downstream QA-E-8006	286.1.1. Less Pressure in QA-V-8007 leading to No Flow to fuel gas purge header and to existing facility	286.1.1.1. PZA-053B low low pressure interlock to open ESDV025 and ESDV040 on backup fuel gas line from existing facility.		

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Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	287. Higher Level	287.1. Spurious closure of ESDV006	287.1.1. Overfilling of QA-V-8007 leading to liquid carry over to flare.	287.1.1.1. ESDV006 is equipped with limit switches (with alarm in DCS). 287.1.1.2. High high level alarm on LIT-008B 287.1.1.3. LIC 009 with high level alarm.		
		287.2. Failure close of LV 009	287.2.1. Same As 267.1.1.	287.2.1.1. LV 109 is equipped with limit switches (with alarm in DCS) 287.2.1.2. Same As 267.1.1.2		
		287.3. Manual valves in the condensate outlet line of QA-V-8007 closed due to misoperation	287.3.1. Same As 267.1.1.	287.3.1.1. Operating procedures. 287.3.1.2. Same As 267.1.1.2		
No/ Less	288. No/ Less Level	288.1. Failure open of LV 009	288.1.1. Gas blow by to the Closed Drain drum QA-V-8008 (#21)	288.1.1.1. LZA008A (low low) Interlock to close the shutdown valve ESDV006 on liquid discharge line.		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (8) 29/07/2013

Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	289. Different Composition	289.1. Different Composition from existing facility due to presence of condensate (during start-up)	289.1.1. Possible two-phase flow in the line due to condensate carry over leading to possible hammering in the line and inside QAE-8006. 289.1.2. Level More in QA-V-8007	289.1.1.1. the tie-in point with existing pipeline is equipped with 12" condensate trap (minimum1500 mm height) 289.1.1.2. piping is slopped towards pipeline	61. Check with the vendor of fuel gas preheater QA-E-8006 that the fuel gas preheater is designed to operate with limited amount of entrained liquid :Refer To 50	Enppi

Session: (8) 29/07/2013

Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	290. Others Maintenance	290.1. Failure of QA-E-8006	290.1.1. Need for isolation, venting, draining and purging	290.1.1.1. Availability of fixed devices for isolation venting & draining. High point vent and low point drains to be provided for line . 290.1.1.2. Provision for utility station for nitrogen purging.	62. Check to provide bypass line of QA-E-8006 in order to guarantee LP fuel gas supply in case of maintenance of QA-E-8006	Enppi

Worksheet

Company: KPC
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Session: (8) 29/07/2013

Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others (cont.)	290. Others Maintenance (cont.)	290.2. Corrosion issues	290.2.1. No causes identified			

Session: (8) 29/07/2013

Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	291. Start up/Shut down Other	291.1. PZA-053B opening ESDV-025/040 from existing pipeline	291.1.1. Increase pressure in the line leading to possible vibration		63. Check the suitable action to eliminate the hazard of gas pressurization in the back up fuel gas supply from existing pipeline (flow orifice , piping support, slow opening of ESDV, ..etc)	Enppi

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (8) 29/07/2013

Node: (17) LP fuel gas system including LP Fuel Gas Back-up Heater QA-E-8006 (OT: °C, OP: barg), LP Fuel Gas Knock Out Drum QA-V-8007 (OT: °C, OP: barg)

Intention: LP fuel gas feed to KOD

Drawings: 3538-200-KKD-12308-1

3538-200-KKD-12308-2

3538-200-KKD-12354

3538-200-KKD-12368

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	292. Failure Utility	292.1. Loss of electrical power	292.1.1. Possible loss of process control	292.1.1.1. UPS provided as backup for all control system .		
			292.1.2. Failure of QA-E-8006 leading to Less Temperature			
		292.2. Loss of instrument air	292.2.1. Spurious closure of ESDV025, ESDV040 on inlet line from upstream existing facility	292.2.1.1. ESDV025, ESDV040n equipped with limit switches with alarm in DCS.		
			292.2.2. spurious closure of PV-054A and PV-054B leading to no flow of fuel gas to flare	292.2.2.1. instrument air receiver provide buffer time of 15 minutes		
				292.2.2.2. packup air compressor connected to emergency power supply		

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Company: KPC
Facility: QASR Compressor station

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Session: (8) 29/07/2013

Node: (18) DELETED - included in node #17

Intention: DELETED - included in node #17

Drawings:

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	293. No/ Less Flow					

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013
Node: (19) HP flare header (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12309
Parameter: Flow

Intention: HP flare collection

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	294. No/ Less Flow (gas)	294.1. Normal condition				
More	295. More Flow (gas)	295.1. Activation of ESD level 1.	295.1.1. More flow to the existing flare.	295.1.1.1. New flare header, existing flare header and flare are designed for max. flow due to activation of ESD level 1 (total plant depressurization) according to Blow Down Report.	64. As per operation history, dispersion modelling from flare stack in case of total plant depressurization (ESD level 1) considering flare flame out, shall be performed.	ENPPI
Reverse	296. Reverse Flow (gas)	296.1. Refer to No Flow of fuel gas from QA-V-8007 (#18)				
Misdirected	297. Misdirected Flow (gas)	297.1. No causes identified				
No/ Less	298. No/ Less Flow (fuel gas)	298.1. No Flow of fuel gas from QA-V-8007 (#18)	298.1.1. No flushing of fuel gas of the flare header leading to possible air back flow from the stack.	298.1.1.1. Low flow alarm on FI007 on fuel gas purge line inlet line		
More	299. More Flow (fuel gas)	299.1. More Flow of fuel gas from QA-V-8007 (#18)	299.1.1. Increased flaring leading to no significant consequences			
Reverse	300. Reverse Flow (fuel gas)	300.1. No Flow of fuel gas from QA-V-8007 (#18)	300.1.1. Possible gas back from to fuel header leading to contamination and More Pressure. 300.1.2. Possible backflow of air from the vent stack leading to possible flammable formation of...	300.1.1.1. Availability of two check valve of dissimilar type in the injection point of fuel gas purge to flare header. 300.1.2.1. Same As 298.1.1.1		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013
Node: (19) HP flare header (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12309
Parameter: Flow

Intention: HP flare collection

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Reverse (cont.)	300. Reverse Flow (fuel gas) (cont.)	300.1. No Flow of fuel gas from QA-V-8007 (#18) (cont.) 300.2. Activation of ESD level 1)	...flammable mixture in the circuit 300.2.1. Same As 300.1.1.	300.1.2.1. Same As 298.1.1.1 (cont.) 300.2.1.1. Availability of two check valve of dissimilar type in the injection point of fuel gas purge to flare header.		
Misdirected	301. Misdirected Flow (fuel gas)	301.1. No causes identified				

Session: (10) 31/07/2013
Node: (19) HP flare header (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12309
Parameter: Temperature

Intention: HP flare collection

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	302. Higher Temperature	302.1. Release of PSV in hot service	302.1.1. No significant consequences	302.1.1.1. Maximum design temperature of flare header is consistent with maximum release temperature from a PSV	:Refer To 2	
Less	303. Lower Temperature	303.1. Activation of ESD level 1 shut down	303.1.1. Formation of wax, hydrates in the flare header 303.1.2. Less Temperature in the existing flare header	303.1.1.1. Minimum design temperature of new flare header is consistent with maximum release temperature from ESD level 1 according to Blow Down Report 303.1.2.1. Minimum design temperature of existing flare header is consistent with maximum release temperature from ESD level 1 according to Blow Down Report		

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Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013
Node: (19) HP flare header (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12309
Parameter: Pressure

Intention: HP flare collection

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	304. Higher Pressure	304.1. Refer To 295.1 (Activation of ESD level 1)				
Less/ Vacuum	305. Less/ Vacuum Pressure	305.1. Refer To 298.1 (No Flow of fuel gas from QA-V-8007 (#18))				

Session: (10) 31/07/2013
Node: (19) HP flare header (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12309
Parameter: Level

Intention: HP flare collection

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	306. No/ Less Level	306.1. No causes identified				
More	307. Higher Level	307.1. Activation of ESD level 1 leading to level increase of existing KO drum	307.1.1. Overfilling of existing KO drum leading to possible excessive flaring	307.1.1.1. LT037/041/344 high high level interlock (2 oo3 voting logic) to activate ESD level 2	65. Verify the existing surge volume in HP KO drum is suitable to accomodate all the condensate produced ESD level 1 (total depressurization).	ENPPI

Session: (10) 31/07/2013
Node: (19) HP flare header (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12309
Parameter: Composition

Intention: HP flare collection

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	308. Different Composition	308.1. Refer To 303.1 (Activation of ESD level 1 shut down)				

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013
Node: (19) HP flare header (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12309
Parameter: Maintenance

Intention: HP flare collection

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	309. Others Maintenance	309.1. No causes identified				

Session: (10) 31/07/2013
Node: (19) HP flare header (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12309
Parameter: Other

Intention: HP flare collection

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	310. Start up/Shut down Other	310.1. No causes identified				

Session: (10) 31/07/2013
Node: (19) HP flare header (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12309
Parameter: Utility

Intention: HP flare collection

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	311. Failure Utility	311.1. Refer To 298.1 (No Flow of fuel gas from QA-V-8007 (#16))				

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013

Node: (20) LP cold vent (OT: °C, OP: barg)

Intention: LP collection to cold vent

Drawings: 3538-200-KKD-12310

3538-200-KKD-12357

Parameter: Flow

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Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013
Node: (20) LP cold vent (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12310
3538-200-KKD-12357

Intention: LP collection to cold vent

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Reverse (cont.)	314. Reverse Flow (gas) (cont.)	...(#11))				
Misdirected	315. Misdirected Flow (gas)	315.1. No causes identified				
No/ Less	316. No/ Less Flow (nitrogen)	316.1. No Flow of nitrogen from QA-V-8007 (#11)	316.1.1. No flushing of nitrogen of the flare header leading to possible air back flow from the stack leading to possible formation of flammable circuit	316.1.1.1. Low flow alarm on FI009 on nitrogen inlet line 316.1.1.2. AI003 oxygen analyser with alarm for high oxygen content		
More	317. More Flow (nitrogen)	317.1. More Flow of nitrogen from QA-V-8007 (#11)	317.1.1. More Flow of nitrogen to cold vent stack			
Reverse	318. Reverse Flow (nitrogen)	318.1. Opening of PSV on LP fuel gas circuit.	318.1.1. Possible gas back from to nitrogen header leading to contamination of nitrogen circuit	318.1.1.1. Availability of check valve in the injection point of nitrogen to flare header.		
Misdirected	319. Misdirected Flow (nitrogen)	319.1. No causes identified				

Session: (10) 31/07/2013
Node: (20) LP cold vent (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12310
3538-200-KKD-12357

Intention: LP collection to cold vent

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	320. Higher Temperature	320.1. Release of vent in hot service	320.1.1. Limited increase of temperature leading to no significant consequence.	320.1.1.1. Maximum design temperature of cold vent is consistent with maximum release temperature from a vent in the circuit		

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Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013
Node: (20) LP cold vent (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12310
3538-200-KKD-12357

Intention: LP collection to cold vent

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	320. Higher Temperature (cont.)	320.1. Release of vent in hot service (cont.)	320.1.1. Limited increase of temperature leading to no significant consequence. (cont.)	320.1.1.2. Operating procedure for the use of cold vent discharge.		
Less	321. Lower Temperature	321.1. Opening of PSV in LP fuel gas circuit.	321.1.1. Decrease of temperature due to gas expansion leading to no significant consequence.	321.1.1.1. Minimum design temperature of cold vent is consistent with maximum release temperature from a vent in the circuit 321.1.1.2. Same As 320.1.1.2.		

Session: (10) 31/07/2013
Node: (20) LP cold vent (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12310
3538-200-KKD-12357

Intention: LP collection to cold vent

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	322. Higher Pressure	322.1. Opening of PSV in LP fuel gas circuit. 322.2. Manual valve on tie in point #22 left closed due to misoperation.	322.2.1. Increase of pressure in cold vent, leading to safe vent impossibility.		68. Configure manual valve on tie in point #22 as locked open.	ENPPI
Less/ Vacuum	323. Less/ Vacuum Pressure	323.1. No causes identified				

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Session: (10) 31/07/2013
Node: (20) LP cold vent (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12310
3538-200-KKD-12357

Intention: LP collection to cold vent

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	324. No/ Less Level	324.1. Not applicable				
More	325. Higher Level	325.1. Not applicable				

Session: (10) 31/07/2013
Node: (20) LP cold vent (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12310
3538-200-KKD-12357

Intention: LP collection to cold vent

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	326. Different Composition	326.1. No Flow of nitrogen from QA-V-8007 (#11)	326.1.1. Possible air back flow from cold vent stack to cold vent circuit leading to possible formation of flammable circuit	326.1.1.1. AI003 oxygen analyser with alarm for high oxygen content		

Session: (10) 31/07/2013
Node: (20) LP cold vent (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12310
3538-200-KKD-12357

Intention: LP collection to cold vent

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	327. Others Maintenance	327.1. No causes identified				

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Company: KPC
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Session: (10) 31/07/2013
Node: (20) LP cold vent (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12310
3538-200-KKD-12357

Intention: LP collection to cold vent

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	328. Start up/Shut down Other	328.1. No causes identified				

Session: (10) 31/07/2013
Node: (20) LP cold vent (OT: °C, OP: barg)
Drawings: 3538-200-KKD-12310
3538-200-KKD-12357

Intention: LP collection to cold vent

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	329. Failure Utility	329.1. Loss of nitrogen	329.1.1. No flushing of nitrogen of the flare header leading to possible air back flow from the stack leading to possible formation of flammable circuit	329.1.1.1. Low level alarm on FI009 on nitrogen inlet line 329.1.1.2. AI003 oxygen analyser with alarm for high oxygen content		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013

Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	330. No/ Less Flow (drain)	<p>330.1. No Flow from draining point in compressor unit</p> <p>330.2. No Flow from upstream existing facility (T-3002)</p> <p>330.3. No Flow from upstream existing facility (T-4008)</p> <p>330.4. Manual valve on inlet line of QA-V-8008 from existing unit closed due to misoperation.</p>	<p>330.1.1. No significant impact</p> <p>330.2.1. Same As 330.1.1</p> <p>330.3.1. Same As 330.1.1</p> <p>330.4.1. Increase of pressure in the line, leading to no significant consequences.</p>	<p>330.4.1.1. Piping is designed for max. shutoff pressure of QA-P-3016 (new pump in the existing facilities).</p> <p>330.4.1.2. QA-P-4016 and QA-P-3016 are equipped with internal PSV.</p>		
More	331. More Flow (drain)	<p>331.1. More Flow from draining point in compressor unit</p> <p>331.2. More Flow from upstream existing facility</p>	<p>331.1.1. Possible More Level in QA-V-8008</p> <p>331.2.1. Same As 330.1.1</p>			
Reverse	332. Reverse Flow (drain)	332.1. Not applicable				
Misdirected	333. Misdirected Flow (drain)	333.1. No Flow from upstream existing facility (T-3002)	333.1.1. Possible back flow of condensate from T-4008 to T-3002 leading to operating upset	333.1.1.1. Check valve in the line from T-3002		

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Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013

Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	333. Misdirected Flow (drain) (cont.)	333.2. No Flow from upstream existing facility (T-4008)	333.2.1. Possible back flow of condensate from T-3002 to T-4008 leading to operating upset	333.2.1.1. Check valve in the line from T-4008		
No/ Less	334. No/ Less Flow (condensate)	334.1. Pump QA-P-8006A/B failure	334.1.1. More Level in QA-V-8008	334.1.1.1. PZA-066A/B low low pressure interlock to stop the pump QA-P-8007A/B		
			334.1.2. Possible Pump QA-P-8007A/B cavitation leading to mechanical damage	334.1.2.1. PIC-036 on suction of QA-P-8007A/B stop the pump in case of low low pressure 334.1.2.2. Standby pump QA-P-8006		
		334.2. Blockage of pump QA-P-8007A/B suction strainer	334.2.1. Pump QA-P-8007A/B cavitation leading to possible mechanical damage	334.2.1.1. High alarm in PDI-065A/B across the pump strainer 334.2.1.2. PZA-066A/B low low pressure interlock to stop the pump QA-P-8007A/B		
		334.3. Pump QA-P-8007A/B failure	334.3.1. Same As 334.1.1	334.3.1.1. Low flow alarm on FI-010 and trip 334.3.1.2. PIC-036 on suction of QA-P-8007A/B start the standby pump in case of high high pressure.		

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Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013

Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	334. No/ Less Flow (condensate) (cont.)	<p>334.3. Pump QA-P-8007A/B failure (cont.)</p> <p>334.4. Failure of PIC063 stopping QA-P-8007A/B</p> <p>334.5. Spurious closure of ESDV-008</p>	<p>334.3.1. Same As 334.1.1 (cont.)</p> <p>334.4.1. Same As 334.1.1</p> <p>334.4.2. more pressure in discharge line of QA-P-8006A/B</p> <p>334.5.1. Same As 334.1.1</p> <p>334.5.2. Increase of pressure up to pump shut-off leading to piping mechanical damage</p>	<p>334.3.1.3. FZA-020A/B low flow interlock to stop the pump QA-P-8007A/B</p> <p>334.4.1.1. Same As 334.3.1.1, 334.3.1.3</p> <p>334.4.2.1. QA-P-8006A/B is equipped with minimum flow line</p> <p>334.4.2.2. design pressure of QA-P-8007A/B is equal to 5.5 barg below design pressure of piping</p> <p>334.5.1.1. ESDV-014 is equipped with limit switches with alarm in DCS</p> <p>334.5.2.1. High pressure alarm in PI-068A/B on pump discharge line</p> <p>334.5.2.2. High high pressure interlock PZA-929A/B on pump discharge line to stop the pump QA-P-8007A/B</p> <p>334.5.2.3. Availability of minimum flow line for each pump regulated by FIC-029A/B</p> <p>334.5.2.4. PSV-930A/B...</p>	<p>69. Check with vendor QA-P-8006 the requirement of min. flow line.</p>	ENPPI

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Session: (10) 31/07/2013

Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	334. No/ Less Flow (condensate) (cont.)	334.5. Spurious closure of ESDV-008 (cont.) 334.6. Failure of LIC-012 stopping pump QA-P-8006A/B 334.7. Spurious closure of XV- 031A/B in pump discharge line 334.8. Spurious closure of ESDV017, ESDV018, ESDV019, ESDV020, ESDV021 in the existing facility (refer to #04A).	334.5.2. Increase of pressure up to pump shut-off leading to piping mechanical damage (cont.) 334.6.1. Same As-334.1.1 334.7.1. Same As-334.1.1, 334.5.2 334.8.1. Same As-334.1.1, 334.5.2	...designed for blocked outlet case 334.7.1.1. Same As-334.5.2.1, 334.5.2.2, 334.5.2.3, 334.5.2.4 334.8.1.1. ESDV017, ESDV018, ESDV019, ESDV020, ESDV021 equipped with limit switches with alarm in DCS. 334.8.1.2. Same As-334.5.2.1, 334.5.2.2, 334.5.2.3, 334.5.2.4	70. Check the possibility of adding the time delay for closure of XV-031A/B after pump stop.	ENPPI
More	335. More Flow (condensate)	335.1. Failure of LIC-012 putting in full speed QA-P-8006A/B 335.2. Failure of PIC063 starting standby pump QA-P-8007A/B	335.1.1. Less level in QA-V-8008 335.2.1. Pump QA-P-8007A/B cavitation leading to possible mechanical damage	335.2.1.1. PZA-066A/B low low pressure interlock to stop the pump QA-P-8007A/B		
Reverse	336. Reverse Flow (condensate)	336.1. Failure of the pump QA- P-8007A/B	336.1.1. Possible back flow of condensate from discharge line back to QA-V-8008 leading to...	336.1.1.1. Check valves on pump discharge		

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Company: KPC
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Session: (10) 31/07/2013

Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Reverse (cont.)	336. Reverse Flow (condensate) (cont.)	336.1. Failure of the pump QA-P-8007A/B (cont.)	...Pressure More	336.1.1.2. in case of pump stop QA-P-8007A/B the relevant XV031A/B on the discharge line will be closed by DCS		
Misdirected	337. Misdirected Flow (condensate)	337.1. PSV-930A/B leakage	337.1.1. No significant impact since the vent line of PSV-930A/B is routed back to QA-V-8005A			

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Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	338. Higher Temperature	338.1. Draining from a hot circuit (compressor casing) 338.2. Draining from a hot circuit (fuel gas KO drum)	338.1.1. Increase of temperature in QA-V-8008 with possible mechanical damage. 338.2.1. Increase of temperature in QA-V-8008 with possible mechanical damage.	338.1.1.1. High high temperature interlock in draining line of compressor casing. 338.2.1.1. Operating temperature of fuel gas KO drum is below design temp. of QA-V-8008 and the expansion of the gas in the draining line will cool down the flow.		
Less	339. Lower...	339.1. Draining from a...	339.1.1. Reduction of...	339.1.1.1. Minimum design...		

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Session: (10) 31/07/2013

Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less (cont.)	...Temperature	...pressurized circuit	...temperature in QA-V-8008 leading to potential for wax formation.	...temperature of QA-V-8008 is equal to minimum temperature at atmospheric pressure of process gas.		
		339.2. Low ambient temperature.	339.2.1. Possible formation of wax leading to possible blockage.	339.2.1.1. Condensate discharge line through pumps QA-P-8006A/B and QA-P-8007A/B are heat traced.		

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Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	340. Higher Pressure	340.1. Refer To 334.5, 334.7, 334.8 (No Flow of condensate)				
		340.2. Failure open of PCV094	340.2.1. Increase of pressure in QA-V-8008 leading to More FLOW of nitrogen to cold vent			
		340.3. Gas blow by from compressor casing.	340.3.1. Increase of gas release to cold vent and to atmosphere.	340.3.1.1. Low level interlock to stop compressor draining from casing.	71. Check that the cold vent design is suitable to accommodate the maximum gas flow...	Enppi

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Session: (10) 31/07/2013

Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	340. Higher Pressure (cont.)	340.3. Gas blow by from compressor casing. (cont.)	340.3.1. Increase of gas release to cold vent and to atmosphere. (cont.)	340.3.1.2. Maximum reachable pressure in QA-V-8008 in case of gas blow by from compressor casing is below design pressure.	...rate due to failure of LV006 in open position (from QA-V-8006). 72. Check that the cold vent design is suitable to accomodate the maximum gas flow rate due to failure of LV009 in open position (from QA-V-8007).	ENPPI
		340.4. Manual valve on line cold vent, is left closed due to misoperation.	340.4.1. Over pressurization of QA-V-8008	340.4.1.1. Manual valve is configured as locked open.		
		340.5. External fire	340.5.1. Same As 340.4.1.	340.5.1.1. Open line to cold vent	73. Check if the cold vent line is suitable to release over pressure due to fire.	
Less/ Vacuum	341. Less/ Vacuum Pressure	341.1. Refer To 334.4 (Failure of PIC063 stopping QA-P-8007A/B)				
		341.2. Failure closed of PCV094	341.2.1. Less Pressure in QA-V-8008 leading to Less Flow of nitrogen to cold vent circuit			

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Session: (10) 31/07/2013

Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	342. Higher Level	342.1. Refer To 334.1, 334.2, 334.3, 334.4, 334.5, 334.6, 334.7, 334.8 (No/ Less Flow (condensate))	342.1.1. Overfilling of QA-V-8008 leading to liquid carry over to cold vent and impossibility to operate draining of the equipment	342.1.1.1. LZA011B high high high level interlock to activate ESD level 2 to shut down the plant.		
No/ Less	343. No/ Less Level	343.1. Refer To 335.1 (Failure of LIC-012 putting in operation QA-P-8007A/B)	343.1.1. Possible cavitation of QA-P-8006A/B leading to mechanical damage 343.1.2. Possible cavitation of QA-P-8007A/B leading to mechanical damage	343.1.1.1. LZA011A low low level interlock to shut down any running pump.		

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Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	344. Different Composition	344.1. Refer To 339.2 (Low ambient temperature).				

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Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	345. Others Maintenance	<p>345.1. Blocking of the pump suction line QA-P-8006A/B</p> <p>345.2. Accumilation of rain inside QA-V-8008 sump.</p> <p>345.3. Accumilation of sand inside QA-V-8008 sump.</p>	<p>345.1.1. Need for the isolation, draining and opening of QA-P-8006.</p> <p>345.2.1. Possible risk of hydrostatic of QA-V-8006 leading to mechanical damage.</p> <p>345.3.1. Same As 345.2.1</p>	<p>345.1.1.1. Availability of fixed devices for isolation venting & draining . High point vent and low point drains to be provided for line .</p> <p>345.1.1.2. Provision for utility station for nitrogen purging.</p> <p>345.1.1.3. Min. submergable distance provided for QA-P-8006A/B to minimize risk of suction blockage.</p> <p>345.1.1.4. Bottom connection for draining QA-V-8008 to GULLY SUCKER.</p> <p>345.2.1.1. Water is removed by a portable pump.</p> <p>345.2.1.2. Accessibility to the sump is provided.</p>		

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Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	346. Start up/Shut down Other	346.1. No causes identified				

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Node: (21) Closed drain header (OT: °C, OP: barg) and Closed Drains Drum QA-V-8008 (OT: 45 °C, OP: atmospheric)

Intention: Closed drain collection

Drawings: 3538-200-KKD-12311

3538-200-KKD-12312

3538-200-KKD-12372

3538-200-KKD-12373

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	347. Failure Utility	347.1. Loss of electrical power	347.1.1. Possible loss of process control 347.1.2. Failure of QA-P-8006A/B leading to More Level 347.1.3. Failure of QA-P-8007A/B leading to More Level	347.1.1.1. UPS provided as backup for all control system .		
		347.2. Loss of instrument air	347.2.1. Spurious closure of ESDV008 on QA-P-8007A/B discharge line.	347.2.1.1. ESDV008 equipped with limit switches with alarm in DCS.		
		347.3. Loss on nitrogen	347.3.1. Less Pressure in QA-V-8008 leading to Less FLOW of nitrogen to cold vent circuit			

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Node: (22) DELETED - included in node #21

Intention: DELETED - included in node #21

Drawings:

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	348. No/ Less Flow					

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Node: (23) Emergency diesel generator QA-G-8002 Closed (OT: °C, OP: barg) Intention: Emergency power supply

Drawings: 3538-200-KKD-12314

3538-200-KKD-12371

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	349. No/ Less Flow	349.1. No Flow of Diesel from Existing Diesel storage	349.1.1. Lack of Diesel in QA-G-8002 leading to unavailability of emergency power in case of need	349.1.1.1. Availability of daily tank inside QA-G-8002.		
		349.2. Manual valve on inlet line of QA-G-8002 left closed due to misoperation	349.2.1. Increase of pressure in the Diesel line up to Diesel pump maximum shut off pressure			
More	350. More Flow	350.1. More Flow of Diesel from Existing Diesel storage	350.1.1. Excess of Diesel in QA-G-8002 leading to possible spill of diesel in QA-G-8002.	350.1.1.1. Availability of daily tank inside QA-G-8002.		
Reverse	351. Reverse Flow	351.1. No causes identified.				
Misdirected	352. Misdirected Flow	352.1. No causes identified				

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Node: (23) Emergency diesel generator QA-G-8002 Closed (OT: °C, OP: barg) Intention: Emergency power supply

Drawings: 3538-200-KKD-12314

3538-200-KKD-12371

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	353. Higher Temperature	353.1. High ambient temperature	353.1.1. No significant consequences.			
Less	354. Lower Temperature	354.1. Low ambient temperature	354.1.1. Possible freezing of diesel in lines.	354.1.1.1. Line is heat traced.		

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Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013

Node: (23) Emergency diesel generator QA-G-8002 Closed (OT: °C, OP: barg) Intention: Emergency power supply

Drawings: 3538-200-KKD-12314

3538-200-KKD-12371

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	355. Higher Pressure	355.1. Refer To 349.2 (Manual valve on inlet line of QA-G-8002 left closed due to misoperation)	355.1.1. Increase of pressure in the line after diesel pump shutoff pressure.		74. Verify that design pressure of new diesel supply line to QA-G-8002 is suitable for design pressure of existing diesel pump.	ENPPI
Less/ Vacuum	356. Less/ Vacuum Pressure	356.1. Refer To 349.1 (No Flow of Diesel from Existing Diesel storage)				

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Node: (23) Emergency diesel generator QA-G-8002 Closed (OT: °C, OP: barg) Intention: Emergency power supply

Drawings: 3538-200-KKD-12314

3538-200-KKD-12371

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	357. No/ Less Level	357.1. Not applicable				
More	358. Higher Level	358.1. Not applicable				

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Node: (23) Emergency diesel generator QA-G-8002 Closed (OT: °C, OP: barg) Intention: Emergency power supply

Drawings: 3538-200-KKD-12314

3538-200-KKD-12371

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	359. Different Composition	359.1. Not applicable				

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Node: (23) Emergency diesel generator QA-G-8002 Closed (OT: °C, OP: barg) Intention: Emergency power supply

Drawings: 3538-200-KKD-12314
3538-200-KKD-12371

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	360. Others Maintenance	360.1. Failure of QA-S-8002	360.1.1. Need for maintenance of QA-S-8002 leading to unavailability of emergency power in case of need			

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Node: (23) Emergency diesel generator QA-G-8002 Closed (OT: °C, OP: barg) Intention: Emergency power supply

Drawings: 3538-200-KKD-12314
3538-200-KKD-12371

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	361. Start up/Shut down Other	361.1. Incorrect startup when required.	361.1.1. Unavailability of emergency power supply.	361.1.1.1. Periodic test of QA-G-8002.		

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Node: (23) Emergency diesel generator QA-G-8002 Closed (OT: °C, OP: barg) Intention: Emergency power supply

Drawings: 3538-200-KKD-12314
3538-200-KKD-12371

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	362. Failure Utility	362.1. Loss of electrical power.	362.1.1. Loss of heat tracing, leading to diesel freezing in winter.		75. Check if indication of state (on/off) of electrical tracing is provided.	ENPPI

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Session: (10) 31/07/2013

Node: (24) Methanol distribution from QA-A-4003B (not included) (OT: 40 °C, OP: 120 barg)

Intention: hydrate inhibitor injection

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12212

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

3538-200-KKD-12354

3538-200-KKD-12358

3538-200-KKD-12368

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	363. No/ Less Flow	363.1. Spurious closure of ESDV027	363.1.1. Unavailability of methanol injection in case of need	363.1.1.1. ESDV025 is equipped with limit switches with alarm in DCS		
			363.1.2. More Pressure in the methanol injection circuit upstream ESDV025			
		363.2. No flow from QA-A-4003B (existing facility)	363.2.1. Less Pressure in the methanol injection circuit leading to unavailability of methanol injection in case of need			
More	364. More Flow	364.1. No causes identified				
Reverse	365. Reverse Flow	365.1. Manual valves in methanol injection point left open due misoperation (high pressure circuit)	365.1.1. Possible back flow of fuel gas to methanol circuit leading to More Pressure in QA-A-4003B	365.1.1.1. Check valve in methanol injection line		
				365.1.1.2. Methanol injection circuit has the same design pressure of suction gas line		
				365.1.1.3. The connection is configured with double block...		

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Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013

Node: (24) Methanol distribution from QA-A-4003B (not included) (OT: 40 °C, OP: 120 barg)

Intention: hydrate inhibitor injection

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12212

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

3538-200-KKD-12354

3538-200-KKD-12358

3538-200-KKD-12368

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Reverse (cont.)	365. Reverse Flow (cont.)	365.1. Manual valves in methanol injection point left open due misoperation (high pressure circuit) (cont.)	365.1.1. Possible back flow of fuel gas to methanol circuit leading to More Pressure in QA-A-4003B (cont.)	...and bleed manual valves		
Misdirected	366. Misdirected Flow	366.1. Manual valves in methanol injection point left open due to misoperation (low pressure circuit)	366.1.1. Increase of methanol consumption	366.1.1.1. Same As 365.1.1.3		

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Session: (10) 31/07/2013

Node: (24) Methanol distribution from QA-A-4003B (not included) (OT: 40 °C, OP: 120 barg)

Intention: hydrate inhibitor injection

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12212

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

3538-200-KKD-12354

3538-200-KKD-12358

3538-200-KKD-12368

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	367. Higher Temperature	367.1. High ambient temperature	367.1.1. No significant consequence.			
Less	368. Lower Temperature	368.1. Low ambient temperature	368.1.1. No significant consequence.			

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Session: (10) 31/07/2013

Node: (24) Methanol distribution from QA-A-4003B (not included) (OT: 40 °C, OP: 120 barg)

Intention: hydrate inhibitor injection

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12212

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

3538-200-KKD-12354

3538-200-KKD-12358

3538-200-KKD-12368

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	369. Higher Pressure	369.1. Spurious closure of ESDV027	369.1.1. Increase of pressure leading to no significant consequence.	369.1.1.1. Design pressure of piping is consistent with design pressure of QA-A-4003B.		
Less/ Vacuum	370. Less/ Vacuum Pressure	370.1. No flow from QA-A-4003B (existing facility)	370.1.1. Less Pressure in the methanol injection circuit leading to unavailability of methanol injection in case of need			

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Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013
Node: (24) Methanol distribution from QA-A-4003B (not included) (OT: 40 °C, OP: 120 barg)
Intention: hydrate inhibitor injection
Drawings: 3538-200-KKD-12210
3538-200-KKD-12211
3538-200-KKD-12212
3538-200-KKD-12214
3538-200-KKD-12221
3538-200-KKD-12222
3538-200-KKD-12224
3538-200-KKD-12353
3538-200-KKD-12354
3538-200-KKD-12358
3538-200-KKD-12368

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	371. No/ Less Level	371.1. Not applicable				
More	372. Higher Level	372.1. Not applicable				

Session: (10) 31/07/2013
Node: (24) Methanol distribution from QA-A-4003B (not included) (OT: 40 °C, OP: 120 barg)
Intention: hydrate inhibitor injection
Drawings: 3538-200-KKD-12210
3538-200-KKD-12211
3538-200-KKD-12212
3538-200-KKD-12214
3538-200-KKD-12221
3538-200-KKD-12222
3538-200-KKD-12224
3538-200-KKD-12353
3538-200-KKD-12354
3538-200-KKD-12358
3538-200-KKD-12368

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	373. Different Composition	373.1. No causes identified				

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Company: KPC
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Session: (10) 31/07/2013
Node: (24) Methanol distribution from QA-A-4003B (not included) (OT: 40 °C, OP: 120 barg)
Intention: hydrate inhibitor injection
Drawings: 3538-200-KKD-12210
3538-200-KKD-12211
3538-200-KKD-12212
3538-200-KKD-12214
3538-200-KKD-12221
3538-200-KKD-12222
3538-200-KKD-12224
3538-200-KKD-12353
3538-200-KKD-12354
3538-200-KKD-12358
3538-200-KKD-12368

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	374. Others Maintenance	374.1. No causes identified				

Session: (10) 31/07/2013
Node: (24) Methanol distribution from QA-A-4003B (not included) (OT: 40 °C, OP: 120 barg)
Intention: hydrate inhibitor injection
Drawings: 3538-200-KKD-12210
3538-200-KKD-12211
3538-200-KKD-12212
3538-200-KKD-12214
3538-200-KKD-12221
3538-200-KKD-12222
3538-200-KKD-12224
3538-200-KKD-12353
3538-200-KKD-12354
3538-200-KKD-12358
3538-200-KKD-12368

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	375. Start up/Shut down Other	375.1. No causes identified				

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (10) 31/07/2013

Node: (24) Methanol distribution from QA-A-4003B (not included) (OT: 40 °C, OP: 120 barg)

Intention: hydrate inhibitor injection

Drawings: 3538-200-KKD-12210

3538-200-KKD-12211

3538-200-KKD-12212

3538-200-KKD-12214

3538-200-KKD-12221

3538-200-KKD-12222

3538-200-KKD-12224

3538-200-KKD-12353

3538-200-KKD-12354

3538-200-KKD-12358

3538-200-KKD-12368

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	376. Failure Utility	376.1. Loss of electrical power	376.1.1. Possible loss of process control	376.1.1.1. UPS provided as backup for all control system .		
		376.2. Loss of instrument air	376.2.1. Spurious closure of ESDV027 on inlet line from upstream existing facility	376.2.1.1. ESDV027 equipped with limit switches with alarm in DCS.		

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Company: KPC
Facility: QASR Compressor station

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Session: (6) 25/07/2013

Node: (25) Turbine Fuel Gas system (OT=90°C , OP=34 barg)

Intention: Provide fuel gas to turbine

Drawings: 3P991-149446-5

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	377. No/ Less Flow	<p>377.1. No fuel gas from upstream circuit</p> <p>377.2. Plugging of filter F2100</p> <p>377.3. Spurious closure of AV2120</p> <p>377.4. Spurious closure of AV2124</p> <p>377.5. Spurious closure of FCE2130</p> <p>377.6. Spurious closure of FCE2140</p>	<p>377.1.1. Turbine shut down leading to compressor QA-K-8001 stop</p> <p>377.2.1. Same As 377.1.1.</p> <p>377.2.2. More pressure in the fuel gas circuit.</p> <p>377.3.1. Same As 377.1.1, 377.2.2</p> <p>377.4.1. Same As 377.1.1, 377.2.2</p> <p>377.5.1. Same As 377.1.1, 377.2.2</p> <p>377.6.1. No Flow of fuel gas to pilot leading to pilot flame out.</p>	<p>377.1.1.1. Low pressure alarm PT-2120.</p> <p>377.1.1.2. Flame detector in a gas combustor to shutdown the turbine in case of flame out. the shutdown sequence closes AV-2120 and AV-2124 and open AV-2121 to vent</p> <p>377.5.1.1. FCE2130 is equipped with position indicator.</p> <p>377.6.1.1. FCE2140 is equipped with position indicator with interlock to stop the turbine.</p>	<p>76. SOLAR to update P&ID to include all safeguards mentioned in present HAZOP study.</p>	SOLAR
More	378. More Flow	378.1. Failure open of FCE2130	378.1.1. More pressure in the circuit			
Reverse	379. Reverse Flow	379.1. No causes identified				

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Company: KPC
Facility: QASR Compressor station

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Session: (6) 25/07/2013
Node: (25) Turbine Fuel Gas system (OT=90°C , OP=34 barg)
Drawings: 3P991-149446-5
Parameter: Flow

Intention: Provide fuel gas to turbine

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected	380. Misdirected Flow	380.1. Spurious opening of AV2150 in fuel gas vent line	380.1.1. Possible back flow from combustion chamber to Gas fuel torch line.	380.1.1.1. Check valve		

Session: (6) 25/07/2013
Node: (25) Turbine Fuel Gas system (OT=90°C , OP=34 barg)
Drawings: 3P991-149446-5
Parameter: Temperature

Intention: Provide fuel gas to turbine

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	381. Higher Temperature	381.1. More Temperature from inlet line	381.1.1. Overheating of fuel gas circuit .	381.1.1.1. High temperature alarm in TE2120 381.1.1.2. High high temperature interlock in TE2120 to shutdown the turbine 381.1.1.3. Design temperature of fuel gas system is consistant with upstream feeding system.		
		381.2. More pressure of fuel gas.	381.2.1. Excessive firing leading to overheating of the combustion chamber	381.2.1.1. High high temperature interlock in combustion chamber to shutdown the turbine.		
Less	382. Lower Temperature	382.1. Less Temperature from inlet line	382.1.1. Possible condensate formation in the fuel gas line leading to possible mechanical damage of turbine burner.	382.1.1.1. Low temperature alarm in TE2120 382.1.1.2. Low low temperature interlock in TE2120 to shutdown the turbine. 382.1.1.3. F2100 /F2001 filters to collect and drain eventual condensate.		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (6) 25/07/2013

Node: (25) Turbine Fuel Gas system (OT=90°C , OP=34 barg)

Intention: Provide fuel gas to turbine

Drawings: 3P991-149446-5

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	383. Higher Pressure	383.1. Failure open of FCE2130.	383.1.1. Excessive firing in combustion chamber leading to temperature increase .	383.1.1.1. High pressure alarm in PE2120 383.1.1.2. High high temperature interlock to stop the turbine	77. SOLAR to provide design case and set point of PSV-2100 according to design pressure. 78. SOLAR to check the possiblty of raising the rating of the fuel gas system to be consistant with upstream feed circuit (600 psi rating) . As alternative, SOLAR to provide additional on/off valve in the inlet of fuel gas circuit (upstream F2100) to be closed by PT2120 high high pressure interlock	SOLAR
		383.2. Failure open of AV2120	383.2.1. Same As 383.1.1	383.2.1.1. High pressure alarm in PE2121		
		383.3. Failure open of AV2124	383.3.1. Same As 383.1.1	383.3.1.1. High pressure alarm in PE2126		
		383.4. Refer To 377.2, 377.3, 377.4, 377.5 (No flow of fuel gas)	383.4.1. Over pressurization of fuel gas circuit.	383.4.1.1. PSV-2100 in the inlet of fuel gas line to protect mechanical integrity of the fuel gas circuit.		
Less/...	384. Less/ Vacuum...	384.1. Less Pressure from...	384.1.1. No flow of fuel gas to...	384.1.1.1. Low pressure alarm...		

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Company: KPC
Facility: QASR Compressor station

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Session: (6) 25/07/2013
Node: (25) Turbine Fuel Gas system (OT=90°C , OP=34 barg)
Drawings: 3P991-149446-5
Parameter: Pressure

Intention: Provide fuel gas to turbine

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
...Vacuum	...Pressure	...inlet line	...combustion chamber leading to possible flame out and compressor QA-K-8001 stop.	...in PE2120 384.1.1.2. Flame detector in a gas combustor to shutdown the turbine in case of flame out,the shutdown sequence closes AV-2120 and AV-2124 and open AV-2121 to vent		
		384.2. Failure closed of AV2120	384.2.1. Same As 384.1.1	384.2.1.1. Low pressure alarm in PE2121		
		384.3. Failure closed of AV2124	384.3.1. Same As 384.1.1			

Session: (6) 25/07/2013
Node: (25) Turbine Fuel Gas system (OT=90°C , OP=34 barg)
Drawings: 3P991-149446-5
Parameter: Level

Intention: Provide fuel gas to turbine

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	385. No/ Less Level	385.1. delayed draining of F2100/F2001	385.1.1. Overfilling of F2100/F2001 leading to condensate carry over to burner leading to possible mechanical damage .	385.1.1.1. LS2101/LS2102/LS 2111/LS2112 high level alarm on FT2100/FT2001 385.1.1.2. Availability of Safeguards against condensate formation in the upstream fuel gas circuit.		
More	386. Higher Level	386.1. Prolonged draining operation of F2100/F2001	386.1.1. fuel gas is unexpectedly sent to close drain and cold vent.	386.1.1.1. Cold vent is equipped with flame arrester. 386.1.1.2. Cold vent is continuously flushed with nitrogen.		

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Company: KPC
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Session: (6) 25/07/2013
Node: (25) Turbine Fuel Gas system (OT=90°C , OP=34 barg)
Drawings: 3P991-149446-5
Parameter: Composition

Intention: Provide fuel gas to turbine

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	387. Different Composition	387.1. Refer To 382.1 (less temperature) 387.2. Increased mercury concentration in fuel gas.	387.2.1. No significant impact due to SOLAR design which is capable to withstand the maximum concentration of mercury as per the feed gas composition. 387.2.2. Increased mercury emissions on turbine stack.	387.2.2.1. The max. concentration of mercury in fuel gas is within acceptable limits.		

Session: (6) 25/07/2013
Node: (25) Turbine Fuel Gas system (OT=90°C , OP=34 barg)
Drawings: 3P991-149446-5
Parameter: Maintenance

Intention: Provide fuel gas to turbine

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	388. Others Maintenance	388.1. Periodic maintenance of fuel gas circuit (Scheduled every 6 months)	388.1.1. Need to vent and Purge the circuit.	388.1.1.1. Availability of fixed devices for venting and Purging.		

Session: (6) 25/07/2013
Node: (25) Turbine Fuel Gas system (OT=90°C , OP=34 barg)
Drawings: 3P991-149446-5
Parameter: Other

Intention: Provide fuel gas to turbine

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	389. Other	389.1. Failure close of AV-2150 during start up. 389.2. Presence of condensate in the gas fuel torch line during...	389.1.1. Unsafe start up procedures due to lack of flame before opening main fuel gas line. 389.2.1. Same As-389.1.1	389.1.1.1. Dedicated system for monitoring the start up procedure and shutdown in case of the torch system is not working properly. 389.2.1.1. Same As-389.1.1.1	79. SOLAR to check the possibility to...	SOLAR

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Company: KPC
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Session: (6) 25/07/2013

Node: (25) Turbine Fuel Gas system (OT=90°C , OP=34 barg)

Intention: Provide fuel gas to turbine

Drawings: 3P991-149446-5

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down (cont.)	389. Other (cont.)	...start up.	389.2.1. Same As 389.1.1 (cont.)	389.2.1.1. Same As 389.1.1.1 (cont.)	...drain the fuel gas torch line before start up in case of presence of condensate in the line.	
		389.3. Failure close of AV2121 during shutdown.	389.3.1. Incomplete venting of fuel gas line.	389.3.1.1. High pressure alarm PT2121 in the isolated section.		

Session: (6) 25/07/2013

Node: (25) Turbine Fuel Gas system (OT=90°C , OP=34 barg)

Intention: Provide fuel gas to turbine

Drawings: 3P991-149446-5

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	390. Failure Utility	390.1. Loss of electrical power	390.1.1. Possible loss of process control	390.1.1.1. Battery recharger provided as backup for all control system .		
		390.2. Loss of instrument air	390.2.1. Spurious closure of AV2120, AV2124			
			390.2.2. Spurious opening of AV2121			

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Company: KPC
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Session: (6) 25/07/2013
Node: (26) Turbine Lube oil system (OP=4 barg, OT=60°C)
Drawings: 3P991-149446-6
3P991-149446-7

Intention: Provide fuel gas to turbine

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	391. No/ Less Flow	391.1. Failure of P3110	391.1.1. No Flow of Lube Oil to lubricating circuit leading to possible mechanical damage.	391.1.1.1. P3110 gear pump driven by turbine shaft 391.1.1.2. PSLL3200 low low pressure interlock in lube oil circuit to stop the turbine and to start up P3150 to guarantee lube. oil circulation during turbine cool down.		
		391.2. Failure of P3150	391.2.1. No Flow of Lube Oil to lubricating circuit during turbine cool down.	391.2.1.1. Same As 452.1.1.2 391.2.1.2. PS3150 Low pressure interlock to activate P3170		
		391.3. Failure of P3170	391.3.1. No Flow of Lube Oil to lubricating circuit during turbine cool down.(Only in case P3150 not working)	391.3.1.1. Same as 454.1.1.2 391.3.1.2. Periodic test of P3170 scheduled		
		391.4. Plugging of F3240/3250	391.4.1. Same As 391.1.1. 391.4.2. More Pressure in lube oil circuit	391.4.1.1. Same As 452.1.1.2 391.4.1.2. High differential pressure alarm in PDIT3240 391.4.2.1. High pressure alarm in PT3200 391.4.2.2. PSV3110		
		391.5. Fouling of air cooler HE3220	391.5.1. Same As 391.4.1, 391.4.2			
		391.6. Plugging of temporary...	391.6.1. Same As 391.4.1,...	391.6.1.1. Same As 391.4.2.1,...		

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Company: KPC
Facility: QASR Compressor station

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Session: (6) 25/07/2013

Node: (26) Turbine Lube oil system (OP=4 barg, OT=60°C)

Intention: Provide fuel gas to turbine

Drawings: 3P991-149446-6

3P991-149446-7

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	391. No/ Less Flow (cont.)	...strainer F3310/F3320/F3340/F3400/F3420/F3430	...391.4.2	...391.4.2.2		
		391.7. Plugging of strainer upstream F3110	391.7.1. Same As 391.4.1, 391.4.2	391.6.1.2. Temporary strainers to be removed after unit commissioning.		
More	392. More Flow	392.1. P3150 failed to stop after start up.	392.1.1. No significant consequences.			
Reverse	393. Reverse Flow	393.1. Failure of P3110	393.1.1. Possible lube oil back flow from P3150 back to P3110	393.1.1.1. Check valve.		
Misdirected	394. Misdirected Flow	394.1. PSV3110 leakage	394.1.1. Lube oil recirculation to tank leading to Less flow to user			
		394.2. Manual valve on F3245/F3250 left open due to mis-operation	394.2.1. Release of Lube oil to the drain system leading to level less on lube oil tank.	394.2.1.1. Operation procedures.		

Session: (6) 25/07/2013

Node: (26) Turbine Lube oil system (OP=4 barg, OT=60°C)

Intention: Provide fuel gas to turbine

Drawings: 3P991-149446-6

3P991-149446-7

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	395. Higher Temperature	395.1. Failure of temperature control system in closed position	395.1.1. More Temperature in lube oil circuit leading to possible damage of bearings.	395.1.1.1. High temperature alarm in TE3200		
				395.1.1.2. High high temperature interlock in TE3200		

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (6) 25/07/2013

Node: (26) Turbine Lube oil system (OP=4 barg, OT=60°C)

Intention: Provide fuel gas to turbine

Drawings: 3P991-149446-6

3P991-149446-7

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	395. Higher Temperature (cont.)	395.2. Excessive thermal load from users	395.2.1. More Temperature in lube oil circuit leading to possible damage of bearings.	395.2.1.1. High temperature alarm in TE3510, TE3520, TE3530, TE3540 downstream users 395.2.1.2. High high temperature interlock in TE3510, TE3520, TE3540		
Less	396. Lower Temperature	396.1. Failure of temperature control system in open position	396.1.1. Less Temperature in lube oil circuit leading to possible damage of bearings.	396.1.1.1. Low temperature alarm in TE3200 396.1.1.2. Low low temperature alarm interlock in TE3200		

Session: (6) 25/07/2013

Node: (26) Turbine Lube oil system (OP=4 barg, OT=60°C)

Intention: Provide fuel gas to turbine

Drawings: 3P991-149446-6

3P991-149446-7

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	397. Higher Pressure	397.1. Refer To 391.4 (Plugging of F3240/3250) 397.2. Failure of PCV3200 in closed position 397.3. Damage of bearings /seals leading to gas blow by...	397.2.1. Pressure More in the lube oil circuit and users leading to mechanical damage. 397.3.1. Pressure increase leading to gas release from vent...	397.2.1.1. High pressure alarm in PT3200 397.2.1.2. P3110 provided with min. flow line. 397.2.1.3. PSV3110 397.3.1.1. Vent line is equipped with flame arrestor and is...		

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Company: KPC
Facility: QASR Compressor station

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Session: (6) 25/07/2013

Node: (26) Turbine Lube oil system (OP=4 barg, OT=60°C)

Intention: Provide fuel gas to turbine

Drawings: 3P991-149446-6

3P991-149446-7

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More (cont.)	397. Higher Pressure (cont.)	...to oil tank	...line.	...installed in safe location. 397.3.1.2. High pressure alarm in PDT3100 397.3.1.3. High high pressure interlock in PDT3100		
Less/ Vacuum	398. Less/ Vacuum Pressure	398.1. Refer To 391.1 (Failure of P3110) 398.2. Refer To 391.4 (Plugging of F3240/3250)				

Session: (6) 25/07/2013

Node: (26) Turbine Lube oil system (OP=4 barg, OT=60°C)

Intention: Provide fuel gas to turbine

Drawings: 3P991-149446-6

3P991-149446-7

Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	399. Higher Level	399.1. Excessive lube oil re-filling due to mis-operation	399.1.1. Overfilling of lube oil tank leading to inefficient lubrication of the bearing	399.1.1.1. High level alarm in LT3100		
More	400. No/ Less Level	400.1. Manual valve on draining line left open due to misoperation	400.1.1. Pump P3110 cavitation leading to No Flow of Lube Oil to lubricating circuit leading to possible mechanical damage. 400.1.2. Possible damage of electrical heater H3103	400.1.1.1. Low level alarm in LT3100 400.1.1.2. Low low level interlock in LT3100 400.1.2.1. Low low level interlock in LT3100 to stop heater H3103		

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Company: KPC
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Session: (6) 25/07/2013
Node: (26) Turbine Lube oil system (OP=4 barg, OT=60°C)
Drawings: 3P991-149446-6
3P991-149446-7

Intention: Provide fuel gas to turbine

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	401. Different Composition	401.1. Contamination of lube oil on contact with user	401.1.1. Possible reduction of efficiency of lubrication.	401.1.1.1. Periodic sampling of oil . 401.1.1.2. Availabilty of lube oil conditiong package.		

Session: (6) 25/07/2013
Node: (26) Turbine Lube oil system (OP=4 barg, OT=60°C)
Drawings: 3P991-149446-6
3P991-149446-7

Intention: Provide fuel gas to turbine

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	402. Others Maintenance	402.1. Plugging of F3240	402.1.1. Need to isolate ,drian and clean the filter	402.1.1.1. Availabilty of fixed devices for isolation ,draining and cleaning		

Session: (6) 25/07/2013
Node: (26) Turbine Lube oil system (OP=4 barg, OT=60°C)
Drawings: 3P991-149446-6
3P991-149446-7

Intention: Provide fuel gas to turbine

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	403. Start up/Shut down Other	403.1. Refer To 391.2, 391.3 (Failure of the pump)				

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Facility: QASR Compressor station

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Session: (6) 25/07/2013
Node: (26) Turbine Lube oil system (OP=4 barg, OT=60°C)
Drawings: 3P991-149446-6
3P991-149446-7

Intention: Provide fuel gas to turbine

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	404. Failure Utility	404.1. Loss of electrical power	404.1.1. Possible loss of process control 404.1.2. Failure of air cooler HE3220 leading to more temperature. 404.1.3. Stop of P3150 during turbine cool down.	404.1.1.1. Battery recharger provided as backup for all control system . 404.1.3.1. Spare pump P3170 (DC pump)		
		404.2. Loss of instrument air	404.2.1. Not applicable.			

Worksheet

Company: KPC
Facility: QASR Compressor station

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Session: (9) 30/07/2013
Node: (27) Compressor dry gas seal system
Drawings: 3P991-149446-6
3P991-149446-7

Intention: Provide fuel gas to turbine

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	405. No/ Less Flow (seal gas)	405.1. No flow of seal gas from plant supply	405.1.1. Loss of primary seal leading to possible process gas flow to flare causing possible mechanical damage.	405.1.1.1. The seal gas supply is taken from the discharge line of compressor QA-K-8001A and it is expected to be available when compressor is running. 405.1.1.2. PDT-5150 low low differential pressure interlock for the pressurized shutdown of the turbine.	80. Check the fail/safe position of AV-5120 and PCV-5150 (seal gas), AV-5110 and PCV-5110 (nitrogen), PCV-5100 (instrument air).	SOLAR
		405.2. Spurious closure of AV5120	405.2.1. Same As 405.1.1			
		405.3. Failure close of PCV5150	405.3.1. Same As 405.1.1			
		405.4. Plugging of filter F5130/F5140	405.4.1. Same As 405.1.1	405.4.1.1. High differential pressure alarm in PDIT5130 across the filters		
		405.5. Failure close of AV5981/AV5991 in seal gas boost system (start up)	405.5.1. Same As 405.1.1			
		405.6. Plugging of filter F5980 in seal gas boost system startup.	405.6.1. Same As 405.1.1			
		405.7. Blockage of check valve	405.7.1. Same As 405.1.1			

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Node: (27) Compressor dry gas seal system
Drawings: 3P991-149446-6
3P991-149446-7

Intention: Provide fuel gas to turbine

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	406. More Flow (seal gas)	406.1. Failure open of PCV5150	406.1.1. Increase of seal gas pressure in the mechanical seals leading to more flow of seal gas to flare, and erosion of dry gas seal.	406.1.1.1. Availability of flow orifice to reduce max. flow. 406.1.1.2. PT-5170 high high pressure in the primary seal vent interlock to shutdown the turbine 406.1.1.3. FT-5175 high high flow in the secondary seal vent interlock to shutdown the turbine		
		406.2. Damage of dry gas seal.	406.2.1. Same As-406.1.1			
Reverse	407. Reverse Flow (seal gas)	407.1. No flow of seal gas from plant supply	407.1.1. Possible back flow of process gas to seal gas circuit leading to mechanical damage.	407.1.1.1. The seal gas supply is taken from the discharge line of compressor QA-K-8001A and it is expected to be available when compressor is running. 407.1.1.2. Check valve in the seal gas inlet line		
		407.2. More pressure in the flare circuit.	407.2.1. Possible backflow of gas from flare to compressor seal.	407.2.1.1. Check valve in flare line 407.2.1.2. PT-5167 high pressure will open AV-5167 to vent to atmosphere.	:Refer To 10	
Misdirected	408. Misdirected Flow (seal gas)	408.1. Failure of internal mechanical seal	408.1.1. Same As-407.1.1			
		408.2. Boost system in operation after startup due to misoperation	408.2.1. No significant consequence.			

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Intention: Provide fuel gas to turbine

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Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Misdirected (cont.)	408. Misdirected Flow (seal gas) (cont.)	408.3. Failure open of AV5167 to vent	408.3.1. Venting of flammable gas to atmosphere (limited amount)	408.3.1.1. Vent is provided with flame arrestor		
No/ Less	409. No/ Less Flow (nitrogen)	409.1. No flow of nitrogen from plant supply	409.1.1. Loss of secondary seal leading to possible process gas flow to cold vent and mechanical damage.	409.1.1.1. Nitrogen circuit is equipped with buffer vessel for 8 hours 409.1.1.2. PT-5110 low low pressure interlock to stop the turbine.		
		409.2. Spurious closure of AV5110	409.2.1. Same As 409.1.1			
		409.3. Failure close of PCV5110	409.3.1. Same As 409.1.1			
		409.4. Plugging of filter F5110	409.4.1. Same As 409.1.1	409.4.1.1. High differential pressure alarm in PDT5110 across the filters 409.4.1.2. High high differential pressure interlock in PDT5110 across the filters to shutdown the turbine.		
		409.5. Blockage of check valve	409.5.1. Same As 409.1.1			
More	410. More Flow (nitrogen)	410.1. Failure open of PCV5110	410.1.1. Increase of seal gas pressure in the mechanical seals leading to more flow of nitrogen to flare, and erosion of dry gas seal.	410.1.1.1. Availability of flow orifice to reduce max. flow. 410.1.1.2. FT-5175 high high flow in the secondary seal vent interlock to shutdown the turbine		

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Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Reverse	411. Reverse Flow (nitrogen)	411.1. No flow of nitrogen from plant supply	411.1.1. Possible back flow of seal gas to nitrogen circuit	411.1.1.1. Double check valve in the nitrogen inlet line.		
Misdirected	412. Misdirected Flow (nitrogen)	412.1. Failure of internal mechanical seal	412.1.1. Same As 411.1.1.			
No/ Less	413. No/ Less Flow (instr. air)	413.1. No flow of instrument air from plant supply	413.1.1. Loss of tertiary seal leading to possible process gas flow to cold vent or to bearing housing, leading to mechanical damage.	413.1.1.1. Instrument air circuit is equipped with spare compressor connected to the emergency power supply line		
			413.1.2. Stop of seal gas boost system during startup.	413.1.1.2. Instrument air circuit is equipped with buffer vessel for 15 minutes		
				413.1.1.3. PDT5100 low low pressure interlock to stop the turbine.		
		413.2. Failure close of PCV5100	413.2.1. Same As 409.1.1			
		413.3. Plugging of filter F5104/5914	413.3.1. Same As 409.1.1	413.3.1.1. High differential pressure alarm in PDIT5104 across the filters		
		413.4. Blockage of check valve.	413.4.1. Same As 409.1.1			
		413.5. No flow of instrument air from plant supply to seal boost pump	413.5.1. Pressure Less in seal gas boost system			

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Intention: Provide fuel gas to turbine

Parameter: Flow

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less (cont.)	413. No/ Less Flow (instr. air) (cont.)	413.6. Plugging of filter F5904/5905	413.6.1. Pressure Less in seal gas boost system	413.6.1.1. High differential pressure alarm in PDT5904		
More	414. More Flow (instr. air)	414.1. Failure open of PV5100	414.1.1. Increase of instrument air flow in the mechanical seals leading to possible lube oil displacement and damage to bearing and more pressure on lube oil tank.	414.1.1.1. PDT-5100 high pressure alarm.		
Reverse	415. Reverse Flow (instr. air)	415.1. No flow of instrument air from plant supply	415.1.1. Possible back flow of nitrogen to instrument air circuit and mechanical damage.	415.1.1.1. Check valve in the instrument air inlet line		
Misdirected	416. Misdirected Flow (instr. air)	416.1. Failure of internal mechanical seal	416.1.1. Same As 415.1.1			
No/ Less						
More						
Reverse						
Misdirected						

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Node: (27) Compressor dry gas seal system

Intention: Provide fuel gas to turbine

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Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	417. Higher Temperature	<p>417.1. More Temperature from seal gas inlet line</p> <p>417.2. More Temperature from nitrogen inlet line</p> <p>417.3. More Temperature from instrument air inlet line</p> <p>417.4. Temperature rise in the discharge line of the compressor.</p>	<p>417.1.1. Overheating of seal gas circuit .</p> <p>417.2.1. Overheating of nitrogen circuit .</p> <p>417.3.1. Overheating of instrument air circuit .</p> <p>417.4.1. Temperature More in Compressor casing</p>	<p>417.1.1.1. Design temperature of seal gas system is consistant with upstream feeding system (200°C)</p> <p>417.2.1.1. Design temperature of nitrogen system is consistant with upstream feeding system (70°C)</p> <p>417.3.1.1. Design temperature of instrument air system is consistant with upstream feeding system (70°C)</p> <p>417.4.1.1. High temperature alarm in TI4430</p> <p>417.4.1.2. TI4430 High high temperature interlock to stop the compressor.</p>		
Less	418. Lower Temperature	<p>418.1. Less Temperature from seal gas inlet line</p> <p>418.2. Less Temperature from nitrogen inlet line</p>	<p>418.1.1. Possible condensate formation in the seal gas line leading to possible mechanical damage of mechanical seal.</p> <p>418.2.1. Possible condensate formation in the nitrogen line leading to possible mechanical damage of mechanical seal.</p>	<p>418.1.1.1. Conditionning skid upstream seal gas inlet line.</p>	<p>81. Check with SOLAR the possibility to provide a low temperature alarm/safeguard in the seal gas treatment skid.</p> <p>82. Check with SOLAR the minimum design temperature for secondary dry gas seal system is consistant with min. design...</p>	<p>SOLAR</p> <p>SOLAR</p>

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Intention: Provide fuel gas to turbine

Parameter: Temperature

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less (cont.)	418. Lower Temperature (cont.)	418.2. Less Temperature from nitrogen inlet line (cont.) 418.3. Less Temperature from instrument air inlet line	418.2.1. Possible condensate formation in the nitrogen line leading to possible mechanical damage of mechanical seal. (cont.) 418.3.1. No significant consequences.		...temperature of nitrogen supply circuit (-25°C). 83. Check with SOLAR the possibility to provide a low temperature alarm/safeguard in case of failure of QA-E-8007 nitrogen heater.	SOLAR

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Intention: Provide fuel gas to turbine

Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
More	419. Higher Pressure	419.1. Refer to Failure open of PV5150 in fuel gas line 419.2. Refer to Failure open of PV5110 in nitrogen line 419.3. Refer to failure open of PV5100 in instrument air line				
Less/ Vacuum	420. Less/ Vacuum Pressure	420.1. Refer To 405.1 (No flow of seal gas from plant supply)				

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Intention: Provide fuel gas to turbine

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Parameter: Pressure

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Less/ Vacuum (cont.)	420. Less/ Vacuum Pressure (cont.)	<p>420.2. Refer To 409.1 (No flow of nitrogen from plant supply)</p> <p>420.3. Refer To 413.1 (No flow of instrument air from plant supply)</p> <p>420.4. Failure of P5980 in seal gas boost system during start up</p>	420.4.1. Loss of primary seal leading to possible process gas flow to flare causing possible mechanical damage.	420.4.1.1. PDT-5150 low low differential pressure interlock for the pressurized shutdown of the turbine.		

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Intention: Provide fuel gas to turbine

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Parameter: Level

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
No/ Less	421. No/ Less Level	421.1. Prolonged drain operation on T9500 due to misoperation.	421.1.1. Possible gas blow by to close drain QA-B-8008.	421.1.1.1. Double block and bleed valves.		
More	422. Higher Level	<p>422.1. Delayed draining operation on T9500 due to misoperation.</p> <p>422.2. Manual valve on draining line of K09500 to T9500 left closed due to misoperation</p>	<p>422.1.1. Possible condensate flow to dry gas seal system leading to damage.</p> <p>422.2.1. Same As 422.1.1.</p>	422.1.1.1. High high level alarm in LI9500.	<p>84. Check if LI9500 is provided with interlock to stop the turbine.</p> <p>85. Check to configure the manual valve on drain line of K09500 to T9500 as Locked Open</p>	<p>SOLAR</p> <p>SOLAR</p>

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Intention: Provide fuel gas to turbine

Parameter: Composition

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Different	423. Different Composition	423.1. Refer To 418.1, 418.2, 418.3 (Less Temperature)				

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Intention: Provide fuel gas to turbine

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others	424. Others Maintenance	424.1. Plugging of F9501/F9502	424.1.1. Need for isolation venting , draining and purging of the F9501/F9501	424.1.1.1. Availability of spare filter. 424.1.1.2. Provision for utility station for nitrogen purging.	86. Check the possibility to install additional manual valve on drain line of F9501/9502 for isolation purposes in consideration of high differential pressure in case of maintenance.	SOLAR
		424.2. Plugging of F5130/5140	424.2.1. Need for isolation venting , draining and purging of the F5130/5140	424.2.1.1. Availability of spare filter. 424.2.1.2. Provision for utility station for nitrogen purging.	87. Check the possibility to configure the manual valve in the inlet line of the seal gas treatment skid as locked open,	
		424.3. Plugging of F5110	424.3.1. Need to shut down the...			

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Intention: Provide fuel gas to turbine

Parameter: Maintenance

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Others (cont.)	424. Others Maintenance (cont.)	424.3. Plugging of F5110 (cont.) 424.4. Plugging of F5104/5914	...turbine. 424.4.1. Need for isolation venting , draining and purging of the F5104/5914	424.4.1.1. Availability of spare filter. 424.4.1.2. Provision for utility station for nitrogen purging.		

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Intention: Provide fuel gas to turbine

Parameter: Other

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Start up/Shut down	425. Start up/Shut down Other	425.1. Settling out pressure during pressurized shut down	425.1.1. Need for activation of seal gas boost system.		88. Check seal gas boost system can be used during pressurized shut down (settling out pressure = 100 barg)	SOLAR

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Intention: Provide fuel gas to turbine

Parameter: Utility

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	RECOMMENDATIONS	BY
Failure	426. Failure Utility	426.1. Loss of electrical power	426.1.1. Possible loss of process control 426.1.2. Failure of H9500 leading to Less Temperature	426.1.1.1. Battery charger is provided as backup for all control system.		

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